Final synopsis Submitted to the Mangalore University for the Award of the Degree of

DOCTOR OF PHILOSOPHY IN POLITICAL SCIENCE

AGRICULTURAL POLICIES - SOCIAL RESPONSE AND ITS IMPLICATIONS IN KARNATAKA – A CASE STUDY OF ENDOSULFAN IN DAKSHINA KANNADA

By

KAVITHA.B

Under the Supervision of

DR. DAYANAND NAIK

Professor of Political Science

Department of Political Science

Mangalore University

Mangalagangothri – 574 199

Karnataka, India

2024

Final synopsis Submitted to the Mangalore University for the Award of the Degree of

DOCTOR OF PHILOSOPHY IN POLITICAL SCIENCE

Agricultural Policies - Social Response and its Implications in Karnataka – a case study of Endosulfan in Dakshina Kannada

Research Guide

DR. DAYANAND NAIK
Professor of Political Science
Department of Political Science
Mangalore University

Research Scholar

KAVITHA. B

DEPARTMENT OF POITICAL SCIENCE

MANGALORE UNIVERSITY

MANGALAGANGOTRI, KONAJE– 574 199

KARNATAKA, INDIA

REGISTRATION DATE : 17. 02.2016

CONTENTS

Sl. No	Contents	Page No.
1	Introduction	
2	Statement of the Problem	
3	Objectives/Purpose of the study	
4	Literature Review	
5	Research Gap	
6	Hypothesis	
7	Theoretical/Conceptual Framework	
8	Scope	
9	Methodology	
10	Chapterization	
11	Major findings of the Thesis	
12	Scope for further Research and Suggestions	
13	References	
14	Appendices-1 Questionnaire	
15	Details of National/ International Presentations and Publications	

AGRICULTURAL POLICIES - SOCIAL RESPONSE AND ITS IMPLICATIONS IN KARNATAKA – A CASE STUDY OF ENDOSULFAN IN DAKSHINA KANNADA

1. Introduction

1.1 Outline of the Research in Broad Terms

Agriculture is described as the backbone of the Indian economy. It contributes a significant share in the generation of the country's national income. More than half of the nation's workforce is employed in the agriculture sector. Agriculture is essential not only to achieve self-reliance but in India agriculture is considered as a way of life. Agriculture shaped thought, outlook, culture and the economic life of the people of India. Therefore it may be said that agriculture lies at the core of socio – economic development and progress of Indian society.

Agriculture was developed at least 10,000 years ago and it has undergone significant changes since the time of the earliest cultivation. Independent development of agriculture occurred in Northern and Southern China, Africa's Sahel, New Guinea and several regions of the America. The agricultural practices like irrigation, crop rotation, fertilizers and pesticides were also developed log ago. Identifying the exact origin of agriculture remains problematic because the agriculture was developed thousands years before the invention of writing. Agriculture was developed independently in the Far East probably in China. Rice as the primarily crop in 6000 B.C on the banks of Nile River. Cultivation of wheat and oranges were found in the 6^{th} millennium B.C in the Indus Valley. By 3000B.C farming of rice had started. By 2500 B.C, rice was an important component of the staple diet in Mohenjo-Daro near the Arabian Sea.

Agriculture is the practice of cultivating plants and livestock to provide facilities to the human beings. It provides food for people and raw materials for industries. In India Agriculture system was began in 9000 B.C. Wheat, Barley and Jujube were the

popular crops at that time. New method of agriculture system like threshing, planting crops in rows, cotton spinning and storing grains in granaries etc were developed during the Neolithic period. And they passed their improved techniques of agricultural production to the next generation. This transformation of knowledge was the base of further development of agriculture in India.[1]

Soon after Independence different policy, programs were introduced by the central and state governments mainly for the production and development of agriculture. After the world war – II, to handle the famine conditions for the first time the government issued a statement on agricultural and food policy in India. The objectives of the policy included increasing food grain and subsidiary food production, improving agricultural production and marketing methods, stimulating production of raw materials for industry and export, securing remunerative prices for producers and fair wages for agricultural labourers ensuring fair distribution of the food produced and promoting national research and education. This resulted in India's Green Revolution. Since 1965 the use of high – yielding varieties of seeds, increased fertilizers and improved irrigation facilities collectively contributed to the Green Revolution in India, which improved the condition of agriculture by increasing crop productivity. Improving crop patterns and strengthening forward and backward linkages between agriculture and industry.

It was around this time, that the pesticide Endosulfan was developed. Endosulfan is a diastereomeric mixture of two Alpha – Endosulfan and Beta- Endosulfan. It belongs to the organochlorine group of pesticides. Endosulfan in pure form it exists as colourless crystals. It slightly solvable in water and mixable with most fungicides and compatible with most pesticides.[2] Endosulfan takes long time to degrade completely especially humid area. According to the The United States Environmental Protection Agency Endosulfan as a highly toxic substance. It seemed like a major innovation at that time, due to its strong acaricidal properties and strong and instant impact.

[1] Bheembai, S. Mulage. History of Agricultural system in India. *International Journal of Humanities social Science and Education,* Vol -4, Issue -7 July
[2] Paul, May. (2011). Endosulfan – The Controversial Insecticide - Molecule of the Month June 2011 – https://www.chm.bris.ac.uk

Endosulfan was started from 1981 onwards. It was sprayed groundly and aerially from 1981. Endosulfan was sprayed by using helicopters and small planes from 1981 to 2000. As per the records of KCDC no aerial spray was undertaken after 2001 onwards.[3] The aerial spraying and ground spraying of Endosulfan was undertaken to control the menace of the tea mosquito bug. Most of the plantations are in hilly areas, during the rain the pesticides drained and got washed down the slopes into drinking water below. The consumption of this water and breathing of polluted air by the people and animals resulted in health related problems. A wide range of health problems have been caused by the use of Endosulfan in Karnataka. Many people of these regions are suffering from health problems ranging from neurological disorders to congenital malformations like Allergy, Asthama, Brain Tumor, Mental retardation, Deafness, Dumbness Epilepsy, Blindness, Fits, Heart Disease Psychological disorders, different types of cancers, Lung diseases, Kidney diseases etc. Studies show that Endosulfan highly toxic to human beings and animals. It can bind to soil particles and persist for a long period. Many countries banned Endosulfan. In India Endosulfan was banned in Kerala and Karnataka.

2. Significance of the Study/ Topic

This study can be justified on the basis of following issues:

Modern agriculture depends on pesticides and fertilizers to a large extent. India stands at 3rd position in pesticide usage in Asia. But the uncontrolled use of pesticides has led to the persistence of their residues in the environment. Long-term illnesses such as diabetes, endocrine disruption, infertility and cancer have been associated with its usage.[4] Endosulfan is one among these pesticides. It is a chlorinated hydrocarbon that gained popularity in the late 1950s. It was introduced as a less harmful pesticide. It was mainly used to kill mites and insects on crops including maize, tea, fruits, cashews, rice, etc. However, now Endosulfan belongs to the class I toxicity and is used in agriculture extensively. Its human-related poisoning was reported from time to time like the effect on nerve cells, genotoxic effects and mutagenic effects in lymphocyte and liver hepatoblastoma cells. Because of this, the use of Endosulfan

[3] Information claimed through RTI-L.No. KCDCE2 RTI/09/2010/D16.2.2010

[4] Nayak P, Solanki H. (2021). Pesticides and Indian agriculture: A review. *Int J Res—Granthaalayah*. 9: 250-63.

was banned globally.[5]

The district of Dakshina Kannada also has many cashew plantations. Here they sprayed cashew trees with Endosulfan. Many villages in Dakshina Kannada district were using this for about two decades. It was reported that there was an increase in the number of cancers, skin problems, infertility and children born with mental and physical defects due to its uncontrolled use.[6] So there is a need to estimate the burden of disability in Endosulfan-sprayed areas which can enhance the knowledge regarding this pesticide use.

This study aimed to assess the severity of disease among persons identified with specific illnesses in Endosulfan-sprayed areas of Dakshina Kannada district and various Government and Non-Government measures taken for the restoration of the Endosulfan Victims in the affected areas of the selected area of the study.

2.1. Statement of the Problem

The General Field or Problematic of the Research Area

"Agricultural Policies: Social Response and its Implications in Karnataka – A case study of Endosulfan in Dakshina Kannada".

2.2 Justification of the Study

Thesis entitled **"Agricultural Policies - Social Response and its Implications in Karnataka" – a Case study of Endosulfan, in Dakshina Kannada,** involved investigations of prevalence rates of health problems of residents in some affected regions of Dakshina Kannada district, Karnataka. It had been several years after the ban on the use of Endosulfan in the plantation and residues are no more present, there is still a likelihood of the children being born with deformities similar to the effects of pesticides poisoning. In fact this study is an attempt to find out the Endosulfan problems of the residents in affected areas, its cause and consequences and Government policies and programmes for the Endosulfan effected inhabitants.

---

[5] Karn SK, Upadhyay A, Kumar A. (2022), *Biomonitoring of Endosulfan Toxicity in Human*. Biocell, 46: 1771-7.

[6] Badiger S, Jacob AM, Bangaraiah AS, Bhandary SK, Hegde S, Kumar P. A study on the distribution of disabilities among the population residing in the endosulfan exposed area in Dakshina Kannada district of Karnataka. Int J Commun Med Public Health 2019;6: 3948-51.

3. Objectives/Purpose of the Study

- To find out the amount of awareness among the farmers about the dangers of Endosulfan.
- To study the impact of Endosulfan on environment.
- To find out the loopholes of agricultural policies.
- To trace out whether Endosulfan spray / agency violating the agricultural policies in the study areas.
- To trace out whether the Endosulfan victims are properly rehabilitated or not.

3.1 Statement on how the proposed research would contribute to the existing knowledge in the field

The study is based on primary and secondary data of the respondents and related departments situated in Dakshina Kannada district of Karnataka state. The study focuses on residents of Endosulfan effected areas of the Dakshina Kannada district only.

3.2 Delimits

It is necessary to point out here it that the present study suffers from certain limitations because of the difficulties encountered during investigation. Despite all possible efforts to make the analysis more comprehensive and scientific, a study of the present kind is bound to have certain limitations. They're mentioned here as under:

- To keep the present study within manageable limits, it is intentionally confined to the selected Endosulfan areas of the Dakshina Kannada district and its victims of the selected areas.
- Only 300 samples were collected on the basis of the evidence and empirical indicators.

4. Literature Review

The present literature survey makes an attempt to review the literature pertaining to the research topic. A few studies which are relevant to the present work have been given below.

Ishwar. C. Dhingra,[7] **The Indian Economy Environment and Policy** (2011), studies shows that the use of chemical fertilizers and pesticides is now widely accepted as one of the key elements in the strategy for accelerating the growth of agricultural productivity, especially in the short run. Efforts have been made since the beginning of the first plan to promote the consumption of chemical fertilizers in the country. It was only in the mid 1960's with the evolution of the HYV seeds that the consumption of fertilizers, and pesticides also increased. Authors opinion is that, in spite of the massive increase in fertilizer and pesticides consumption, the fact remains that fertilizer and pesticides use per hectare of land is still much less than in many of the countries of the world.

Pesticides in Agriculture – A Boon or a Curse? A Case Study of Kerala, EPW June 26, 2010, Indira Devi. P., studies investigates that, the government of Kerala has banned the sale and use of Endosulfan consequent to the controversies over the environmental and human health problems due to the aerial spraying of the chemicals in cashew plantations in the state. Still chemicals used by the farmers. The chemicals are seen prevalent among pineapple and mango growers. In her study she suggested the need for effective policy interventions and extension mechanism to regulate the use of pesticides in agriculture, while aiming at the food safety and security issues. Author's opinion is the awareness regarding the legal status of the chemical is very low in India. Most of the farmers and many of the pesticide inspectors are not aware of the status, especially with regard to restricted use of chemicals. Therefore she suggested proper training and awareness creation programme may be framed in a manner to disseminate this aspect.[8]

Abhishek, Saini. (2012), **Endosulfan: Do We Really Need It**?[9] discussed the necessity of effective government policy to avoid the problems of Endosulfan. He

[7]Dhingra, C. Ishwar. (2011). *The Indian Economy- Environment and Policy*. Sultan Chand and Sons Publications. New Delhi.
[8]Indira, Devi. P. (2010). Pesticides in Agriculture- A Boon or Curse, A Case Study of Kerala, *Economic and Political Weekly*, June 26.
[9]Abhishek Saini. (2012). *Endosulfan: Do We Really Need It*? (Oct 2012). http:endosulfanstudy.blog

explains that Endosulfan was already banned in many countries like the United States, The European Union, Brazil, Canada, Australia and New Zealand but it was widely used in developing countries like India and China. Endosulfan was introduced to Indian agriculture during 'Green Revolution'. Cheap, effective and highly toxic Endosulfan was widely and readily accepted by the Indian Farmers. Because of the lobby consisting of manufacturers of agrochemicals and other large agro based industries, government refused to ban Endosulfan. India stood against the ban of the pesticides even when an International consensus arose much to the horror of those who had been victims of the deadly chemicals.

Shalin, Doshi, (2012),[10] studies discussed when the Nation started to use the Endosulfan in Indian agriculture. He states that since1965, the use of high yielding verities of seeds, increased fertilizers and improved irrigation facilities collectively contributed to the green revolution in India, which improved the condition of agriculture by increasing crop productivity, improving crop patterns and strengthening forward and backward linkages between agriculture and industry. Increase in production of crops also resulted in an increase in need for pesticides and other synthetic chemicals to support the growing demands. It was around this time, that the pesticide Endosulfan was developed. In 1954, The company Hoechst AG first won approval for use of Endosulfan in the United States legally. But Endosulfan came to Indian market in around the 1970's. Author says that India couldn't have stopped the use of Endosulfan in the initial stages, as feeding the population was a higher priority, and as we would have become a stable economy, we could have afforded to proceed to more sustainable methods. But now India is a self-sufficient nation, in terms of agricultural economy, hence he says ban of Endosulfan. Doshi further says that if India bans the Endosulfan our economy will not take a nasty hit. But that would also mean saving the lives of thousands more.

Rohith, Salunke. (2012), **Political Issues for Endosulfan Ban in India**, studies showed that Endosulfan affects human health such as mental retardation, cancer and infertility in the victims. When central Government banned the use of Endosulfan in Kerala and Karnataka, according to the decision of the Supreme Court, the decision of

[10] Shalin, Doshi. (2012). *Endosulfan Crisis – How it All Began?* (Oct 2012) http://endosulfanstudy.blogspot.com.

the Government greatly hamper the Endosulfan manufacturer companies which would in turn greatly affect Indian economy as India is amongst the largest exporters of Endosulfan in the world. Hence when global conference decided on a global ban on Endosulfan while India still maintained its stance. Rohith Salunke studies shows that the Government is cheating the people of the nation to benefit themselves. The politicians are very self-cantered and not effectively doing the job to help the victims. He also states that the victims of Endosulfan were also turned down showing the ignorant and negligent policies of the government.[11]

Abhijith, Thampi. K. (2012), studies discussed how Endosulfan was sprayed in the cashew plantations in Cheemeni estate in Kasaragod affect the human health and environment. The aerial spraying of Endosulfan was undertaken in this estate to contain the menace of the tea mosquito bug. Thampi says that pesticides sprayed in cashew plantations are drained and got washed down the slopes during rain into drinking water below. The consumption of this water by the people and animals resulted in diseases ranging from physical deformities, cancers, birth disorders and damages to brain and nervous system. He compared the victims of Endosulfan tragedy in Kerala to the victims of Bhopal gas tragedy.[12]

Impact of Pesticides use in Agriculture: Their Benefits and Hazards. (2009), Md. Wasim Aktar, Dwaipayan Sengupta and Ashim Chowdhary analyses the both positive and negative impact of pesticides in Indian agriculture. While discussing the advantages of pesticides they said, use of pesticides in agriculture helps to improve the productivity and also increase the quality of food and prevent reduction in rice yield. Hence farmers are started to use more quantity of pesticides to improve the productivity. The study also investigates the negative impact of pesticides like it affect human health and also environment.[13]

---

[11] Rohith, Salunke. (2012). *Political issues for Endosulfan Ban in India,* October 2012, http://endosulfanstudyblogspot in /2012/10/Endosulfan-do-we-really-need-it html.

[12]Abhijith, Thampi. K. (2012*). Endosulfan: How it Affected Kerala*, Oct 11, 2012. http://endosulfanstudy,blog

[13] Md. Wasim Aktar, Dwaipayan Sengupta and Ashim Chowdhary. (2009). *Impact of Pesticides use in Agriculture: Their Benefits and Hazards*, Volume 2: Issue 1, March 2009

K.K.Sharma in his work, **Pesticide Residue Analysis Manual,** (1993)[14], analyses the tolerance limit of the Endosulfan in various fruits and vegetables. He states that Endosulfan registered under/ section 9 (3) of the insecticide act 1968. Vikas Singhal (2003),[15] discussed the problems created by Endosulfan in Padre village and its impact on human health and environment. Author says that in 2001 after protests from some environmental groups in Kasaragod, Kerala government temporarily banned aerial spraying of Endosulfan in the state and set up an expert committee to find the causes of health problem. The committee found no direct evidence these problems were caused by Endosulfan. However the committee recommended pesticide rotation to reduce development of pest resistance and also recommended banning of aerial spraying of Endosulfan in hilly terrain.

H. K. Jain (2010), **The Green Revolution: History, Impact and Future**, explains how the agricultural policy responsible for the advent of pesticides in India. The author studies shows that modern agriculture especially in the later half of the 20th century was to see the development of a totally new class of pesticides, the organic pesticides, which continue to dominate world agriculture for pest control to this day. Jain also focused on the importance of integrated pest management (IPM) in the agriculture to avoid the problems of pesticides.[16]

Prof. M. C.Varshneya and Anil Javalekar, (ed.), **India's Perspective Policy on Agriculture**, discussed the various policies of the government towards pesticides, its benefits and shortcomings. Authors states that Government formulate the various policies and suggest measures for effective regulation of pesticides production, monitoring, judicious use, capacity building etc and reduce the ill effects on human beings, animals and environment. But in spite of these policies residues in the form of the toxicant that remains in the environment like soil, water, plant harvested produce etc.[17]

---

[14] Sharma K. K. (1993). *Pesticide Residue Analysis Manual*. Directorate of Information and Publication of Agriculture. New Delhi.
[15] Singhalm Vikas. (2003). *Indian Agriculture*. Indian Economic Data Research centre.
[16] Jain, H.K. (2010). *The Green Revolution: History, Impact and Future*, Stadium Press. LLC.
[17] Varshneya, M.C. Javalekar Anil. (2015). (ed.) *India's Perspective Policy on Agriculture*, Uttan Krushi Sansodhan Sanstha.

Bandyopadhyay, P.C. (2016), in his work, **Fertigation, Fundamentals and Applications**, investigates the both positive and negative impact of pesticides and insecticides on Indian agriculture. Pesticides can prevent sickness in humans that could be caused by mouldy food or diseased produce. Insecticides can protect animals from illnesses. It also saves farmers money by preventing crop losses to insects and other pests. But use of pesticides in agriculture also raises environment related problems and health related problems.[18]

Sukanya, R. and Sridhar, R. (2004), case study shows that specific epidemiologic evidence of Endosulfan affecting the reproductive development of children. Childrens are the most affected by the use of Endosulfan. They explains that in 1991 and1999 Government constitute the many committees to review the continued use of pesticides (Bannerjee 1991,

R.B.Singh 1999 and Inter Ministerial Committee 1999) have recommended the use of Endosulfan in the country with a condition that Endosulfan should not be used near any water bodies. This part of the order was never implemented any part of India.[19]

The End of Days for Endosulfan (2011), article analyses the reports of various committees and its impact on Kerala and Karnataka. On the basis of reports of various committees in 2001, the Kerala Government issues orders to suspend the use of Endosulfan in all crops and plantations. The Karnataka Government also banned the use of Endosulfan in the year 2011. Though the Kerala and Karnataka banned the pesticide, it is still being smuggled across the state borders to meet a huge demand from big plantation owners, hence the call for a national ban. Author says that Endosulfan's days are certainly numbered. India has around 11 years to phase out this controversial pesticide. The furore created by Endosulfan will have for reaching effects on all chemical pesticides and may someday pave the way for more organic farming methods that are slowly developing in pockets across India.[20]

---

[18] Bandyopadhyay, P.C. (2016). *Fertigation, Fundamentals and Application*, Biotech Books. New Delhi.

[19] *Monitoring of Endosulfan Residues in the 11 Panchayats of Kasaragod*, Kerala – https://www.cseindia.org.

[20] *The End of Days for Endosulfan.* (2011). http://www.bedroc.in.

Buta, Singh and Bhatt, V. (ed.), **Problems and Prospects of Agriculture in India** (1985), justified the use of Endosulfan and other pesticides in agriculture. Singh explains that the role of pesticides will be no doubt important but it has to be consistent with the best safeguards for the preservation of human and animal health and of the purity of our environment. Hence he suggested Industry and Government should take all necessary steps to ensure that only the safest pesticides are produced and used and the best possible measures are taken for their safe use.[21]

Shailesh, Telang. (Aug 2011), studies showed that world is using Endosulfan since its introduction in the 1950's. As it is a pesticide; it is most widely used in agriculture. Previously it was considered as a safer alternative to other organochlorine pesticides in many countries but in the last two decades many countries have recognized the hazards of wide application of this pesticide s and have restricted its use. Telang explains Endosulfan is banned in Singapore, Belize, Tonga, Syria, Germany, Sweden, Philippines, Netherlands, St. Lucia, Columbia, Cambodia, Bahrain, Kuwait, Oman, Qatar Saudi Arabia, UAE, Srilanka and Pakistan and restricted use is permitted in Australia, Bangladesh, Indonesia, Iran, Japan, Korea, Kazakhstan, Lithuania, Thailand, Taiwan, Denmark, Serbia and Norway, Finland, Russia, Panama, Iceland, Canada the United States and the U.K.

In Indian scenario (Shailesh Telang, 2011), except the states of Kerala and Karnataka, India is one of the nations where Endosulfan is not banned and can be freely used. But in case of Kerala, extreme public pressure has been considered and use of Endosulfan was banned by the order of the Supreme Court of India. Authors opinion here is that banning Endosulfan would not solve the problems of Indian farmers as pesticides are a basic need for them to improve crop productivity and India have to look for an alternative pesticide which is as cheap as Endosulfan and with lesser bad environmental and health impacts.[22]

Endosulfan destroyed biodiversity of Kasaragod villages (The Hindu April, 2011), states that the aerial spraying of Endosulfan in the cashew plantations of state owned Plantation Corporation of Kerala caused disaster on the biodiversity of the area. The

[21] Singh, Buta. Bhatt V.S. (1985). (ed.) Problems and Prospects of Agriculture in India, *Indian council of Agricultural Research*.
[22] Shailesh, Telang. (2011). *The Story of Endosulfan in India*, https://greencleanguide.com.

pesticide hit the plants and animals of the area besides causing endless human sufferings.[23]

Alternatives to Endosulfan, (Oct 20, 2012), explains that the union agriculture ministry has long been arguing that there is no alternative to Endosulfan and hence it should be banned only in Kerala and Karnataka where intensive use had affected the health and well-being of people. However, evidence is emerging that Endosulfan was indeed causing harm to the people in other states like Tamil Nadu, West Bengal and Punjab also. It is suggested that agriculture ministry looked at the alternatives suggested by the committee and promoted eco system based approaches on pest management as well as technical interventions using natural plant extracts in a big way.[24]

Jason Burke – India's Children reap the bitter harvest of Endosulfan article focus on the problems faced by the villagers of Kattuka. He states that the Endosulfan could cause large number of diseases reported from Kasaragod district of Kerala and Dakshina Kannada district of Karnataka and the mechanism of action of the pesticides in human body. He says that studies may still be needed to conclusively establish that some of the diseases manifesting in the district is indeed caused by Endosulfan.[25]

Dr. Mohammed Aisheel studies analyses that the Endosulfan could cause large number of diseases reported from Kasaragod district of Kerala and Dakshina Kannada district of Karnataka and the mechanism of action of the pesticides in human body. He says that studies may still be needed to conclusively establish that some of the diseases manifesting in the district is indeed caused by Endosulfan.

It was another Ordeal for Endosulfan Victims (Feb, 2016), discussed the approach of the government towards Endosulfan victims. The approach of the successive Government to the Endosulfan problem had been far from satisfactory. The National

---

[23] Endosulfan Destroyed Bio Diversity of Kasaragod Villages. *The Hindu.* April 2011.

[24] Savvy, Soumya Misra. (2011). *Alternatives to Endosulfan,* (Oct 20, 2011) https://www.downtoearth.org.in.

[25] Jason, Burke. (2012). *India's Children Reap the Bitter Harvest of Endosulfan*. www.theguardian.com, 11 January.

Human Rights Commission recommended compensation and other measures. Still the compensation has not reached all. As to rehabilitative and remediative measures, the Government could not even do what the voluntary agencies could. As the water bodies were contaminated, the Government took no steps to supply pure drinking water to the affected area for two decades after the problem became known. This blog has said that the settlement two years ago was aimed at fooling the victims.[26]

Savvy, Soumya Misra. (Down to Earth March 2011), states that 32,604 litres of Endosulfan was aerially sprayed between 1980 and 2000 on 850 hectares in Belthangady and Puttur Taluks in Dakshina Kannada. In addition, 11,225litres were sprayed manually. The spraying affected nearly 20 villages. Health conditions in these villages are scary. People are suffering from problems like congenital deformities, mental retardation and physical deformities. The impact of Endosulfan in these areas are similar to those affected in Kearla's Kasaragod village. Misra says that the spraying in Dakshina Kannada was stopped in 2000 but farmers are also using it in large quantities on different crops and vegetables across Karnataka since it costs less. Endosulfan is used on crops like paddy, and sorghum; vegetables like brinjal and cabbage; the plantation crops like coffee, cashewnut and tea.[27]

Another Kasaragod (2011), article analyses the impact of Endosulfan on the health conditions of the villages in Puttur and Belthangady Taluk. Like Kerala's Kasaragod, neighbouring Dakshina Kannada is bearing the brunt of spraying of Endosulfan. While Kasaragod grabbed media spotlight and Kerala banned the pesticide, but victims in Karnataka are still struggle for recognition.[28]

Aparna, Pallavi. (Down to Earth 2012), explains that the scale of the Endosulfan tragedy in Karnataka's Dakshina Kannada district may be much larger than hitherto estimated. According to Karnataka cashew Development Corporation (KCDC) aerial spraying was done in 92 villages in 4 Taluks of Puttur division. But recently RTI activist from Puttur, Sanjeev Kabaka, found intensive spraying on the scale of neighbouring Kasaragod in Kerala was done in not one but four divisions, comprising

[26] It was another Ordeal for Endosulfan Victims (Feb 2016) – https://expert-eyes.in.
[27] Savvy, Soumya Misra, (2017). Down to Earth – Tracking Decades – Long Endosulfan tragedy in Kerala, January. https://www.downtoearth.org.in.
[28] Savvy, Soumya Misra. (2010). Another Kasaragod : Endosulfan victims in Karnataka,31 December 2010- https://www.ritimo.org.

16 taluks. Kabaka found 20 year spraying involved using not just Endosulfan but a cocktail of pesticide like Sevin Carbary, Lexacin Monocrotophos.[29]

Royal Society of Chemistry, (May, 2011), states that India is the world's largest producer of the chemical, including state run production facilities, India has the most to lose from the ban. It explains that India is home to nearly three quarters of global production of Endosulfan which is off patent and, therefore, much cheaper than never patented pesticides. Endosulfan has already been banned or is being phased out in most countries including the European Union and the United states. In addition to Indian companies, the Israeli company Makhteshim Agan is the only other producer of Endosulfan. The problem is whenever there is some talk of alternatives, the pesticide lobby can only think of replacing it with chemical alternatives to times costlier than Endosulfan. Royal society of Chemistry insist that it is the responsibility of the Government to stop thinking in terms of money , but in terms of the health of farmers and it has to go with chemicals then it should manufacture safer and cheaper products.[30]

5. Research Gap

The present study "Agricultural Policies: Social Response and its Implications in Karnataka– A case study of Endosulfan in Dakshina Kannada," was explains about how the Endosulfan tragedy was taken place in the Dakshina Kannada, problems and consequences of the Endosulfan victims, government programmes and rehabilitation from the Government and Non-government agencies in detailed with the help of primary and secondary Informations collected through the field investigation from the selected study areas of the Dakshina Kannada district.

As per the information provided, so far no research study has been conducted on the "Agricultural Policies: Social Response and its Implications in Karnataka – A case study of Endosulfan in Dakshina Kannada". The study aims at identifying significant relationship between agricultural policies, social response and its implications in Karnataka.

[29] Aparna, Pallavi. (2012). A Hurried Job- Down to Earth. November. http://www.downtoearth.org.in
[30] Endosulfan Banned as Agreement is Reached with India, *Royal Society of Chemistry*, May 2012-rsc.org/chemistry world/…/

6. Hypothesis

The research study proposes the following hypothesis on the basis of the background literature and oral information on the issue:

- The agricultural policies are not implemented systematically in Dakshina Kannada.
- The victims of the Endosulfan are not given proper compensation and redress their grievances
- The information on the Endosulfan policy and their repercussions are not well addressed in the civil society to pressuring the Government as an interest group
- Lack of awareness among the farmers in the field area, on the merits and demerits of the agricultural policies especially on Endosulfan
- The state Government is ineffective in implementing the ban and sale of the pesticides
- Whether there is a tie between the Government and Endosulfan companies for its continuation?

7. Theoretical/Conceptual Framework

When we traced the history of Dakshina Kannada it was found that the Alupas ruled the erstwhile Dakshina Kannada region between the 8th century and 14th century. Before 1860, Dakshina Kannada was part of a district called Kanara, which was under a single administration in the Madras presidency. In 186 British split the area into South Kanara and North Kanara, The South Kanara being retained in the Madras presidency, while the North Kanara made a part of Bombay presidency in 1862. According to the State Reorganisation Act of 1956 Dakshina Kannada was transferred to Mysore state. Later for the purpose of better administration the Government of Karnataka split the greater Dakshina Kannada district into Udupi and Dakshina Kannada.

According to the 2011 census Dakshina Kannada has a population of 2,08,9649 of which male 1,034,714 and females were 1,054,935. Dakshina Kannada has a sex ratio of 1018 females for every 1000 males and a literacy rate of 88.62%. Agriculture is the major occupation of the people of Dakshina Kannada. The main crops of Dakshina Kannada are Paddy, Coconut, Arecanut, Black pepper, Cashew and Cocoa.

In Karnataka a greater number of Endosulfan victims are found in the various villages of Dakshina Kannada. 56 villages of Belthangady, 8 villages of Bantwal,62 villages of Puttur, 12 villages of Mangaluru and 28 villages of Sullia taluk declared as Endosulfan affected areas. Apart from these villages Endosulfan victims are also found in some other villages also. Even though large number of population affected by this deadly chemical, proper rehabilitation facilities are not provided to the victims of these areas. Hence for the present research Dakshina Kannada has been selected to focus more on the particular problem.

8. Scope of the Study

The study is based on primary and secondary data of Endosulfan victims and including related departmental Informations of the study area. The study focuses on residents of highly effected and selected Endosulfan areas of the Dakshina Kannada district only. Since the study encompasses only to Dakshina Kannada district in Karnataka, it is considered to be a micro study in nature. The study is also based on the practical evidence gathered through the field study; it is an empirical research also.

9. Methodology

The 300 samples will be taken for the study from the Endosulfan affected areas of the Dakshina Kannada district. The study was also supported by the primary data which was collected by set of survey questionnaires. This study adopted convenient random sampling for the field investigation and interviews the related respondents. The data gathered will be tabulated and utilised in this study in the form of tables and graphs whenever necessary.

Besides, with an interest in witnessing the side effects of the Endosulfan personally a participant observation method will be exercised. Interview will be conducted on those people who are the victims or their relatives and the activists for the compensatory process of the Government and NGO's.

A case study will be conducted to examine a single situation, persons, groups or institutions as an examples whole in order to identify types and process of Endosulfan policy. This will help us to examine in detail a given situation.

The survey method will be adopted to trace out supply of information on the policy and problems and to explain the phenomenon in the research field.

9.1 Data Processing and Analysis

Several interconnected processes are carried out during the analysis phase to collect and rearrange the data. Data analysis is performed on both the qualitative and quantitative data collected in the study.

- The study employed descriptive statistics to summarise and describe the key features of a set of measurements. The inferential data was used to draw conclusions about the characteristics of the population based on data derived from a sample of that population.
- To interpret the data meaningfully, the frequencies are converted to proportions or percentages are used.
- Cross tabulation techniques were used. Cross-tabulations, which are the primary tabular method for displaying data for detecting an association between two variables are used in the study to represent the interactions of the dependent and the independent variables.
- The Chi-square test used to test for significance in frequency distribution analysis. Correlational analysis is used to assess the strength of any statistically significant association discovered by the chi-square statistic.
- Independent sample t-test Results, one-way ANOVA were used for testing the relationship between different variables.

The IBM SPSS (Statistical Package for the Social Sciences) Ver- 26 software was used for the statistical analysis.

10. Chapterization

Present thesis consists of five chapters as below:

1. Introduction
2. Review of National Agricultural policy – Its Social and Political Implications
3. District Profile of the Dakshina Kannada
4. Data Analysis
5. Summary, Findings and Suggestions

11. Major findings of the Thesis

11.1 Thematic or chapter wise presentation of the research

The present Research study has five chapters:

- The first chapter is the **Introduction,** which gives a background of Agricultural policy, activities and programs at the National, State and local levels. It also focuses on the objectives of the study, review of literature, method of analysis and sample size and Chapterization etc.
- The second chapter is on **Review of National Agricultural policy – Its Social and Political Implications** and explains the agricultural policies as prescribed in the three lists of the Constitution.
- The third chapter reviews the **District Profile of the Dakshina Kannada** which was taken for the field investigation. It also explains about the various features of the study area and how the selected district effected for the Endosulfan tragedy.
- Fourth chapter is about the **Data analysis** and Interpretations of socio. Economic conditions of the respondents and various schemes and provisions provided by the Government, Rehabilitation programmes from the various Government and Non-Government agencies, various pros and cons of the Endosulfan and suggestions collected form the victims and their families.
- The fifth chapter focus on the **Summary, Findings, and Suggestions,** if there is any research gap, and further scope for the research work and conclusions.

12. Field Observations

Presentation of Overall Observation of the Thesis

SUMMARY, FINDINGS, AND SUGGESTIONS

The findings from a comprehensive survey conducted among victims of Endosulfan exposure, aiming to understand the impact of this harmful pesticide on individuals and communities. It provides an overview of the demographic distribution of the respondents specifically to find if targeted interventions are required. It also briefs the issues related to the exposure to Endosulfan faced by the victims as observed in the quantitative analysis in the previous chapter and suggestions to improve their

conditions through specific interventions by the government. The chapter is covered with the objective accomplishment cross referenced whenever applicable.

Following were the Objectives of this Research:

1. To find out the amount of awareness among the farmers about the dangers of Endosulfan.
2. To study the impact of Endosulfan on environment.
3. To find out the loopholes of agricultural policies.
4. To trace out whether Endosulfan spray / agency violating the agricultural policies in the study areas.
5. To trace out whether the Endosulfan victims are properly rehabilitated or not.

Further, following points which emerged out on the basis hypothesis in Chapter 1 have also been addressed in this chapter:

1. The agricultural policies are not implemented systematically in Dakshina Kannada.
2. The victims of the Endosulfan are not given proper compensation and redress their grievances
3. The information on the Endosulfan policy and their repercussions are not well addressed in the civil society to pressuring the Government as an interest group
4. Lack of awareness among the farmers in the field area, on the merits and demerits of the agricultural policies especially on Endosulfan
5. The state Government is ineffective in implementing the ban and sale of the pesticides
6. Whether there is a tie between the Government and Endosulfan companies for its continuation?

The findings through the survey have been used to address these points.

12.1 Sociodemographic Distribution of Respondents

1. The *age distribution* of the surveyed population revealed a diverse representation across various age ranges, offering a comprehensive snapshot of the demographic makeup under study. The majority of individuals fell within younger age brackets, with a gradual decline in numbers as age increases. Notably, age groups between 21 and 40 years old collectively constitute approximately 60% of the total sample. Additionally, the distribution demonstrates a relatively balanced spread of individuals across adjacent age intervals, suggesting a representative cross-section of different life stages. However, there are observable fluctuations in counts and percentages within specific age groups, indicating variations in population density across certain age ranges. Overall, the age distribution provides valuable insights for further analysis and interpretation in the context of the study's objectives or research questions. It also informs the development of targeted interventions or policies tailored to address the unique needs of different age cohorts within the population.

2. Regarding *gender distribution* in the total sample under consideration, 54.3% are male, and 45.7% are female, indicating a slight majority of males. However, the gender distribution demonstrates near equality in responses from both genders, with approximately 10% more inclined towards males. This suggests a relatively balanced representation of male and female participants in the sample, albeit with a slight male majority.

3. The *educational level distribution* among the surveyed population offers a comprehensive overview of educational attainment levels. The majority of respondents have received some form of formal education, with the largest percentage (34.0%) indicating no formal education, highlighting potential gaps in basic literacy and numeracy skills. Conversely, a small proportion holds higher degrees, indicating specialized skills. Between these extremes, there are varying levels of educational attainment, with a significant portion (27.3%) completing 8 to 10 years of studies, likely representing completion of primary education. Smaller percentages have completed different schooling levels, ranging from special education to 11 to 12 years of studies. This distribution underscores the diversity of educational backgrounds within the surveyed population, informing policymakers and educators about the need

for targeted interventions to address educational disparities and promote lifelong learning opportunities for all individuals.

4. The *marital status distribution* among the surveyed population delineates individuals based on their marital status. The largest proportion consists of unmarried individuals, totalling 247 people and accounting for 82.3% of the total surveyed population. This category typically includes individuals who have never been married or are not currently in a marital relationship. Married individuals represent the second-largest group, comprising 51 people and making up 17.0% of the total population. This category encompasses individuals in legally recognized marital unions. Divorcees and widows each represent a very small proportion of the population, with 1 person each, constituting 0.3% of the total population for each category. Divorcees are individuals who have legally dissolved their marriages, while widows are individuals whose spouses have passed away. Thus, the marital status distribution offers insights into the diverse marital statuses within the surveyed population, with the majority being unmarried individuals, followed by married individuals, and a smaller representation of divorcees and widows.

5. The *family structure distribution* among the respondents provided insight into the composition of families within the surveyed population. The dataset categorized respondents into three types of family structures: Joint, Nuclear, and Extended. It was observed that the majority of the family structures were of the nuclear type, comprising 81.7% of the respondents, with a significant proportion (18.7%) categorized under Joint families. Notably, there were no respondents identified as belonging to the Extended Family type in this survey. Analyzing the distribution of family structures allows researchers and policymakers to understand prevailing family dynamics and social arrangements within the surveyed population. This understanding can inform the development of various social policies, family interventions, and support services tailored to meet the diverse needs of different family types, ultimately contributing to more effective and inclusive social development initiatives.

6. The survey results indicated a variety of *family sizes* among respondents, providing insight into the familial dynamics within the sample population. The majority of respondents (45.7%) report families with 3 to 4 members, indicating a prevalent family size. Additionally, a significant portion (36%) report families with 5 to 6

members, suggesting a sizable proportion of moderately sized families. Furthermore, a smaller yet notable proportion (9%) report larger families consisting of 7 to 8 members, with an even smaller minority reporting even larger family sizes ranging from 9 to 12 members, collectively accounting for 13% of the sample. These findings underscore the diversity of family sizes among respondents, emphasizing the importance of considering familial dynamics and responsibilities when analyzing the outcomes and implications of the study.

7. The data revealed a significant majority of respondents, totalling 94.0%, reported an *annual income* of up to INR 50,000, indicating a predominant presence of individuals with lower income levels. Additionally, a small proportion of respondents, comprising 3.3%, fell within the income bracket of INR 51,000 to INR 75,000, while an even smaller percentage, at 2.7%, reported incomes ranging from INR 75,001 to INR 100,000. This breakdown underscores the economic diversity within the sample population and offers valuable context for interpreting subsequent analyses related to workplace attitudes, behaviors, and outcomes.

8. The results revealed the *distribution of landholding* among respondents, offering insights into the scale of agricultural operations within the surveyed population. A majority (66.0%) reported landholdings ranging from 5 to 10 cents, indicating a prevalence of relatively small-scale farming. Additionally, 17.0% reported landholdings of up to 5 cents, highlighting significant engagement in small-scale farming activities. Conversely, smaller percentages reported larger landholdings, with 14.0% between 10.1 and 50 cents, and 3.0% ranging from 50.1 cents to 1 acre. These findings underscore the predominance of small and medium-scale agricultural operations, with implications for policy, resource allocation, and rural development. Addressing the specific needs of small-scale farmers, such as access to credit and markets, is crucial for enhancing productivity and livelihoods. Tailored interventions promoting sustainable practices and improving market linkages can unlock the potential of smallholder agriculture for broader socio-economic development.

9. It was found from *marital data* that majority of respondents, constituting 66.0%, got married between the ages of 21 and 25, indicating a common trend of marrying in early adulthood. Additionally, 17.0% of respondents married between the ages of 15 and 20, suggesting a notable proportion marrying at a relatively younger age. A

smaller percentage of respondents, 14.0%, got married between the ages of 26 and 30, while only 3.0% married at the age of 30 and above. This distribution highlights the prevailing age range for marriage among the study population, providing insight into socio-cultural norms and practices surrounding marital decisions within the research area.

10. Regarding the *housing status* of respondents, majority of the respondents owned a house (97.3%), while only a very small percentage (2.7%) were yet to have their own houses. The breakdown of housing types reported by respondents in the survey was provided in the table. The majority of respondents, comprising 185 individuals, indicated living in tiled houses, representing 61.70% of the total sample. Following closely behind were those residing in RCC (Reinforced Cement Concrete) houses, with 104 respondents, constituting 34.60% of the surveyed population. Additionally, there were a smaller number of individuals dwelling in huts (6 respondents, 2%) and kachcha (5 respondents, 1.70%) houses, indicating a minority presence of more traditional or temporary housing structures within the surveyed community.

11. Regarding *basic amenities*, it was observed that all the respondents of this survey had *electricity* and *toilet facilities* in their homes, demographic aspects of the *drinking water* supply status among respondents in the survey revealed a diverse range of sources utilized within the community. The majority of respondents, comprising 45.30%, relied on well water for their drinking needs, highlighting a significant dependence on groundwater. Additionally, approximately 41% of respondents accessed drinking water through piped water systems, indicating a substantial portion of the population connected to centralized water infrastructure. A notable percentage of respondents, accounting for 9.70%, utilized bore wells, suggesting an alternative to traditional wells for accessing groundwater. Furthermore, there were smaller percentages of respondents who utilized combinations of different water sources, such as well and pipe water (2.30%), demonstrating variations in water access strategies within the surveyed population. The negligible percentages associated with lake water and other combined sources suggested less common or supplementary water sources within the community. Thus, these demographic insights underscored the varied reliance on different water sources among respondents, reflecting the complex dynamics of water supply in the surveyed area.

12. The demographic data on *fathers' ages* revealed a diverse distribution, with the largest group aged 56 to 65 years (29.7%), followed closely by those aged 46 to 55 years (29.0%). Older fathers aged 66 to 75 years represented 21.0% of respondents, while younger fathers aged 35 to 45 years comprised 13.0%. Smaller proportions were observed in older age brackets, from 76 to 90 years. Similarly, the data on *mothers' ages* showed a diverse distribution, with the largest group aged 35 to 45 years (30.30%), followed by those aged 46 to 55 years (28.30%) and 56 to 65 years (28.0%). Older mothers aged 66 to 90 years represented smaller proportions.

13. The demographic data on respondents' *fathers' education status* revealed a varied distribution across different educational levels. The majority of fathers, comprising 54% of the surveyed population, had received education ranging from 1 to 5 years, indicating a basic level of literacy or primary education. Additionally, a significant portion, constituting 24.7%, had attained education spanning 6 to 7 years, likely representing completion of primary or lower secondary education. Moreover, 14.3% of respondents' fathers had achieved education levels ranging from 8 to 10 years, suggesting completion of secondary education. Smaller proportions of fathers had attained higher education levels, with 2.7% at the Pre-University Course (PUC) level, 2.3% at the graduation level, and a minimal fraction of 0.3% having pursued technical education through Industrial Training Institutes (ITI). This distribution reflected the diverse educational backgrounds of the respondents' fathers, ranging from basic literacy to higher education and technical training.

14. Similarly, the demographic aspect of *mothers' education status* among respondents to the survey provided insight into the educational background of mothers within the surveyed population. The data revealed a diverse distribution across various levels of education. The largest percentage of mothers, comprising 40.7%, had received education ranging from 1 to 5 years. Following closely behind, 31.7% of mothers had attained education spanning 6 to 7 years. Additionally, 21% had completed 8 to 10 years of education. A smaller percentage, 3.3%, had pursued education up to the pre-university level (PUC), while 1.3% had obtained a graduation degree. It was noteworthy that a minority, comprising 1.7%, were reported as illiterate, indicating a segment within the population that lacked formal education. Moreover, a minimal percentage, 0.3%, had undergone vocational training through

Industrial Training Institutes (ITI). This distribution underscored the varying educational backgrounds among mothers within the surveyed community, which could have implications for various socio-economic factors such as household dynamics, child development, and access to resources.

15. In the survey data concerning the demographics of *respondents' fathers' occupations,* a diverse spectrum of professions was revealed. Agriculture and allied activities accounted for the largest proportion at 22%, indicating a significant presence in rural and agricultural sectors. Meanwhile, the category of 'Coolie' held the highest percentage at 32%, indicating a substantial portion of the population engaged in manual labour. Additionally, self-employment or foreign jobs represented 16.3%, suggesting entrepreneurial endeavours or employment opportunities beyond national borders. Small business and skilled labour each constituted notable portions at 7.3% and 7% respectively, reflecting a blend of entrepreneurial spirit and specialized expertise within the workforce. Other categories such as industrial labour, teaching, and government jobs held smaller percentages, while a significant proportion (10%) was listed as jobless, highlighting potential socioeconomic challenges within the community.

16. The demographics of *respondents' mothers' occupations* revealed a predominant representation of homemakers, comprising 84% of the sample. Skilled labour was also notable, constituting 6% of respondents' mothers. Agriculture and allied activities, along with coolie labour, each represented 2.4% and 2% respectively, showcasing a smaller yet a presence. Industrial labour and small business ownership each accounted for 0.3%, while those in government jobs or other departments represented 1% of respondents' mothers. Additionally, 4% of respondents' mothers were reported as jobless, reflecting a diverse range of occupational statuses within the surveyed population.

It is important to note that all the 300 respondents to this survey, indicated that they were victims of Endosulfan in one way or the other and the next section deals with the issues related to Endosulfan and all of them have been recorded in the government documents.

12.2 Effects of Endosulfan

1. The Objective 1: Awareness of farmers about the dangers of Endosulfan: The survey revealed various levels of awareness among respondents regarding Endosulfan and its alternatives, as well as government interventions. A majority of respondents were aware of the types of diseases caused by Endosulfan (74.3%), while a significant portion were not aware (25%). However, the majority lacked awareness about the necessity of pest control (66%) and the cost of Endosulfan (93%). None of the respondents reported current usage of Endosulfan, indicating cessation of its use. Most respondents were aware of the use of banned pesticides as a punishable offense (68.7%) and the majority were using organic pesticides instead of Endosulfan (68.7%), with the primary alternatives being Organic and Poultry manure (55.3%) and Bio Pesticides and Bio-insecticides (44.7%). However, a significant portion of respondents (86.7%) were unaware of pesticides other than Endosulfan. Moreover, awareness of government awareness programs on organic pesticides was low (9.7%).

Recommendations for Government Interventions in addition to awareness campaigns and access to information mentioned before:

i. **Regulatory Enforcement:** Strengthen enforcement mechanisms to ensure compliance with bans on harmful pesticides like Endosulfan and punish offenders to deter illegal usage.
ii. **Support Programs:** Establish support programs to assist farmers in transitioning from Endosulfan to organic and sustainable pest control methods, including subsidies for organic inputs and training programs.
iii. **Collaboration with Health and Agricultural Departments:** Foster collaboration between health and agricultural departments to provide holistic support to affected communities, including healthcare services for victims and agricultural extension services for sustainable farming practices.
iv. **Grievance Redressal Mechanisms:** Improve grievance redressal mechanisms to address the concerns of affected communities effectively and transparently, facilitating access to justice and support services.

2. Objective 2: To study the impact of Endosulfan on environment.

Hypothesis 1 - The agricultural policies are not implemented systematically in Dakshina Kannada.

Based on the finding of this research several implications have been drawn mainly in the form of governmental interventions which are as follows:

1. It was found that the *indirect effect* of Endosulfan is almost triple (74.7%) of the *direct effect* (25.3%). This indicates that there is a need to focus more on the indirect effects of Endosulfan on the victims as the number of victims is more. *The indirect effect on the Endosulfan victims supports the hypothesis-1 that agricultural policies are not implemented systematically in Dakshina Kannada.*

   The demographic analysis of respondents citing the *cause of Endosulfan* victimization revealed a predominant association with the spraying of Endosulfan in farms by the National Research Cashew Corporation (NCCO), accounting for 74.3% of respondents. This suggests a significant impact on individuals residing in agricultural areas or those closely linked to agricultural activities. Additionally, 17% of respondents attribute victimization to exposure through a combination of air and water contamination, indicating potential vulnerability among communities situated near areas where Endosulfan was extensively used. A smaller proportion, 4%, highlight the ingestion of contaminated food, breast milk, and blood as contributing factors, indicating a broader scope of exposure across different demographic groups, including women and infants. Similarly, 4.7% emphasize the impact of Endosulfan through breast milk and blood exposure, underscoring the vulnerability of breastfeeding mothers and infants to this environmental toxin. Thus, the data suggests a multifaceted demographic impact, with varying degrees of exposure across different population segments.

Suggested Governmental Interventions:

i. **Compensation and Rehabilitation**: Provide adequate compensation and rehabilitation support to victims of Endosulfan exposure, including medical

assistance, vocational training, and livelihood support. In fact this has been recommended by earlier researchers in similar situation.[31]

ii. **Awareness and Education:** Launching comprehensive awareness campaigns to educate communities about the health hazards associated with Endosulfan exposure and promoting safer agricultural practices may be attempted as it has produced results before.[32]

iii. **Environmental Remediation:** Undertaking environmental remediation measures to mitigate the contamination of air and water sources in areas affected by Endosulfan spraying has been recommended by several researchers and may be tried.[33]

iv. **Healthcare Services:** Strengthen healthcare infrastructure in rural areas to ensure accessible and affordable healthcare services for Endosulfan victims, with a focus on specialized treatment for neurological disorders and reproductive health issues.

v. **Research and Development:** Allocate resources for research and development initiatives aimed at developing safer alternatives to Endosulfan and conducting longitudinal studies to monitor the long-term health effects of Endosulfan exposure as emphasized by several researchers in such similar situations.[34]

2. The demographic analysis of *respondents' family members suffering from Endosulfan* caused illness reveals that a significant majority, approximately 85.3%, reported having one family member affected by the condition. A smaller proportion, around 12.7%, indicated that two members of their family were suffering from Endosulfan Illness. Conversely, only a minority, comprising 2%

[31] Pradyumna, A., & Chelaton, J. (2018). The Endosulfan Tragedy of Kasaragod: Health and ethics in Non-health sector Programs. *Ethics in Public Health Practice in India*, 85-104.

[32] Oliveira Pasiani, J., Torres, P., Roniery Silva, J., Zago Diniz, B., & Dutra Caldas, E. (2012). Knowledge, Attitudes, Practices and Biomonitoring of Farmers and Residents exposed to Pesticides in Brazil. *International Journal of environmental research and public health*, *9*(9), 3051-3068. Sapbamrer, R. (2018). Pesticide use, Poisoning, and Knowledge and Unsafe Occupational Practices in Thailand. *New Solutions: a Journal of Environmental and Occupational Health Policy*, *28*(2), 283-302.

[33] Boudh, S., & Singh, J. S. (2019). Pesticide Contamination: Environmental Problems and Remediation Strategies. *Emerging and Eco-friendly Approaches for Waste Management*, 245-269. Rajmohan, K. S., Chandrasekaran, R., & Varjani, S. (2020). A Review on Occurrence of Pesticides in Environment and Current Technologies for their Remediation and Management. *Indian Journal of Microbiology*, *60*, 125-138.

[34] Nikolopoulou, D., Ntzani, E., Kyriakopoulou, K., Anagnostopoulos, C., & Machera, K. (2023). Priorities and Challenges in Methodology for Human Health Risk Assessment from Combined Exposure to Multiple Chemicals. *Toxics*, *11*(5), 401.

of respondents, reported three family members affected by the illness. This distribution highlights the prevalence of single cases within families, while also recognizing instances where multiple family members are impacted, albeit less frequently.

Recommendations for Government Interventions:

i. **Healthcare Access:** Ensure accessible and specialized healthcare services for individuals affected by Endosulfan Illness, including diagnostic facilities, treatment options, and rehabilitation programs as it is a very effective form of control.[35]

ii. **Support Services:** Provide comprehensive support services for affected families, including counselling, psychosocial support, and financial assistance to alleviate the burden of healthcare expenses as recommended by earlier researchers.[36]

iii. **Awareness Campaigns:** Launching targeted awareness campaigns to educate communities about the symptoms, risks, and preventive measures related to Endosulfan Illness, aiming to reduce further exposure and stigma associated with the condition may be considered. Awareness campaigns have been tried very successfully across the countries and there are mechanisms in the present case also but the frequencies have to be increased for its effective use.

iv. **Research and Surveillance:** Allocate more **resources** for on-going research and surveillance programs to monitor the prevalence, incidence, and long-term health impacts of Endosulfan Illness, informing evidence-based policymaking and intervention strategies as tried in similar cases.[37]

---

[35] Augustine, A. (2016). Community-Based Rehabilitation for Children with Intellectual Disability: A Case Study of Endosulfan Affected Areas in India. *Disability, CBR & Inclusive Development*, *27*(3), 132-140.

[36] Dhaliwal, L. K. (2020). Health Equity and Sustainable Development Goals: Role and the Complexity. *Good Health and Well-Being*, 316-324. Minas, H., Mendis, J., & Hall, T. (2017). Mental health system development in Sri Lanka. *Mental health in Asia and the pacific: Historical and Cultural Perspectives*, 59-77.

[37] Lekei, E., Ngowi, A. V., Kapeleka, J., & London, L. (2020). Acute Pesticide Poisoning amongst Adolescent Girls and Women in Northern Tanzania. *BMC Public Health*, *20*(1), 1-8. Litovitz, T. L., Klein-Schwartz, W., Rodgers Jr, G. C., Cobaugh, D. J., Youniss, J., Omslaer, J. C., & Benson, B. E. (2002). 2001 Annual Report of the American Association of Poison Control Centres Toxic Exposure Surveillance System. *The American Journal of Emergency Medicine*, *20*(5), 391-452.

3. The survey on the *health condition of respondents* indicated that 31.3% were experiencing health issues associated with Endosulfan exposure, while the majority, comprising 68.7%, reported no such health problems. This data underscores the significant impact of Endosulfan on human health, with a considerable portion of the respondents suffering adverse effects.

Recommendations for Government Interventions:

i. **Medical Assistance:** Provide **immediate** medical assistance and healthcare services to individuals experiencing health issues related to Endosulfan exposure. Ensure access to specialized treatment and on-going monitoring of health conditions.
ii. **Rehabilitation Support:** Implement rehabilitation programs to support affected individuals in recovering from health impacts and regaining their quality of life. This may include physical therapy, counselling, and vocational training to facilitate socio-economic integration as tried in similar cases.[38]
iii. **Long-Term Support:** Establish mechanisms for long-term support and care for Endosulfan victims, considering the chronic and progressive nature of certain health conditions.[39] This may involve setting up support groups, helplines, and community-based care initiatives.
iv. **Advocacy for Safer Alternatives:** Advocate **for** the adoption of safer alternatives to Endosulfan in agricultural practices, emphasizing the importance of sustainable and environmentally friendly pest management strategies as recommended by several researchers.[40]

4. It was observed that a negligibly small number of respondents (1.7%) had bad habits such as alcoholism or using Pan-parag. Even though the number seems to

[38] Pillai, R. R., Kasi, S., & Diwakar, D. (2023). Prevalence of Psychological Distress among the Caregivers of an Endosulfan Disaster Victims in India: a cross-sectional community-based study. *The Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, *59*(1), 1-9.
[39] Pradyumna, A., & Chelaton, J. (2018). The Endosulfan tragedy of Kasaragod: Health and Ethics in Non-health sector Programs. *Ethics in Public Health Practice in India*, 85-104.
[40] Marini, D. A. (2023). White Spatial Politics in Mainstream Agroecology Activism in Argentina. *Latin American and Caribbean Ethnic Studies*, *18*(2), 282-295. Sony, R. K., Münster, D., & Krishnan, S. (2023). What counts as evidence? Examining the Controversy over Pesticide Exposure and Etiology in an Environmental Justice Movement in Kerala, India. *Environmental Sociology*, *9*(2), 148-164.

be small, following measures may be necessary to eradicate it completely and also see that the addiction rate is monitored and controlled well.

i. **Public Awareness Campaigns:** Launch comprehensive public awareness campaigns highlighting the health risks and social consequences of alcoholism and the use of Pan-parag or Gutka. These campaigns should target both individuals and communities, emphasizing the negative impacts on physical health, mental well-being, and social relationships.
ii. **Education and Counselling:** Implement educational programs in schools, colleges, and communities to educate individuals about the harmful effects of alcoholism and substance abuse as advised by several researchers.[41] Offering counselling services and support groups for individuals struggling with addiction, providing them with resources and guidance to overcome their dependence will also help.
iii. **Regulation and Policy Measures:** Enforcing stricter regulations on the production, sale, and advertising of alcohol and tobacco products, including Pan-parag and Gutka may be tried. Implementing measures such as increased taxation, age restrictions, and warning labels to discourage consumption and limit accessibility has also been tried successfully and is worth a try.[42]
iv. **Access to Treatment and Rehabilitation:** Ensuring access to affordable and quality treatment services for individuals seeking help for alcoholism or substance abuse may help to a great deal. Establishing rehabilitation centres and support networks offering detoxification programs, counselling, and therapy to assist individuals in recovery may be undertaken.
v. **Community Engagement and Support:** Mobilize community-based organizations, religious institutions, and civil society groups to actively

[41] Wechsler, H., & Nelson, T. F. (2008). What we have learned from the Harvard School of Public Health College Alcohol Study: Focusing attention on college student alcohol consumption and the environmental conditions that promote it. *Journal of Studies on Alcohol and Drugs*, *69*(4), 481-490. Wolfson, M., Champion, H., McCoy, T. P., Rhodes, S. D., Ip, E. H., Blocker, J. N., ... & DuRant, R. H. (2012). Impact of a Randomized Campus/Community Trial to Prevent High-risk Drinking among College Students. *Alcoholism: Clinical and Experimental Research*, *36*(10), 1767-1778.

[42] Babor, T. F., & Caetano, R. (2005). Evidence-based Alcohol Policy in the Americas: Strengths, Weaknesses, and Future Challenges. *Revista Panamericana de Salud Pública*, *18*(4-5), 327-337. Norman, T., Anderson-Luxford, D., O'Brien, P., & Room, R. (2024). Regulating Alcohol Advertising for Public Health and Welfare in the age of Digital Marketing: Challenges and Options. *Drugs: Education, Prevention and Policy*, *31*(1), 70-81.

participate in prevention and intervention efforts.[43] Foster a supportive community environment that promotes healthy lifestyles and offers assistance to those in need of support.

vi. **Economic Opportunities:** Address underlying socio-economic factors contributing to alcoholism and substance abuse by promoting economic opportunities, skill development programs, and employment initiatives in affected communities can be of help.[44] Providing alternatives to substance use through recreational activities, vocational training, and community development projects have been successfully tried and may be introduced in the context of this research.[45]

vii. **Collaboration and Partnerships:** Foster collaboration between government agencies, healthcare providers, non-profit organizations, educational institutions, and businesses to develop comprehensive strategies and programs for alcohol and substance abuse prevention and intervention which has been tried successfully.[46]

By implementing these interventions in a coordinated and holistic manner, it is possible to address the complex challenges associated with alcoholism and substance abuse, leading to improved health outcomes and enhanced well-being for individuals and communities.

3. Objective 3- To find out the loopholes of agricultural policies: The survey revealed a notable lack of awareness of agricultural policies among respondents, with only 3.7% indicating awareness, while a significant majority of 96.3% reported a lack of awareness. This stark contrast underscores a concerning gap in knowledge regarding governmental initiatives and regulations pertaining to agriculture.

---

[43] Al-Worafi, Y. M. (2023). Substance Abuse in Developing Countries: Alcohol. In *Handbook of Medical and Health Sciences in Developing Countries: Education, Practice, and Research* (pp. 1-22). Cham: Springer International Publishing.

[44] Mathiyazhagan, S., Kulandai Raj, F., Fitrianingsih, K., Raja, V., & Mayom, D. (2024). Addressing Socioeconomic Determinants of Youth Suicidal Ideation: lessons from a Youth Development Approach in India. *Community Mental Health Journal*, *60*(2), 340-353.

[45] Crowe, C. L., Liu, L., Bagnarol, N., & Fried, L. P. (2024). Loneliness Prevention and the Role of the Public Health System. *Perspectives in Public Health*, *144*(1), 31-38.

[46] Bala, S., & Kang'ethe, S. M. (2022). Exploring the Synergy Between Government and Business Entities in the fight Against Substance abuse in East London. a 2018-2021 study. *Social Work*, *58*(1), 19-29. Macy, R. J., & Goodbourn, M. (2012). Promoting Successful Collaborations between Domestic Violence and Substance abuse Treatment Service Sectors: A Review of the Literature. *Trauma, Violence, & Abuse*, *13*(4), 234-251.

Recommendations for Government Interventions:

i. **Improved Communication Channels:** The government may establish more accessible and effective communication channels to disseminate information about agricultural policies to the general populace. This could include utilizing digital platforms, community outreach programs, and traditional media channels to reach a broader audience as found by other researchers.[47]

ii. **Educational Efforts:** Invest in educational initiatives aimed at increasing awareness and understanding of agricultural policies among farmers, stakeholders, and the general public. This could involve organizing workshops, seminars, and training sessions focused on agricultural policy objectives, implementation strategies, and benefits.[48]

iii. **Stakeholder Engagement:** Encouraging active participation and feedback from stakeholders in the development and implementation of agricultural policies has been tried successfully in many countries.[49] Establishing platforms for dialogue and consultation to ensure that policies are aligned with the needs and priorities of the agricultural community is also worth a try.[50]

iv. **Outreach Programs:** Implementing targeted outreach programs in rural and agricultural areas to raise awareness about specific agricultural policies, programs, and support mechanisms available to farmers has been tried before successfully and worth a consideration.[51] This could involve collaborating

---

[47] Kalorth, N., & Sreekumar, R. (2015). 'SEEDS'of'Good Lessons' through'Many a Drop'--Media Initiation in Environmental Education: An Indian Model of Environmental Pedagogy. *Earth Common Journal*, *5*(1), 1-14.

[48] Escalada, M. M., & Heong, K. L. (2007, September). Communication and Implementation of Change in Crop Protection. In *Ciba Foundation Symposium 177-Crop Protection and Sustainable Agriculture: Crop Protection and Sustainable Agriculture: Ciba Foundation Symposium 177* (pp. 191-207). Chichester, UK: John Wiley & Sons, Ltd.

[49] Henle, K., Alard, D., Clitherow, J., Cobb, P., Firbank, L., Kull, T., & Young, J. (2008). Identifying and Managing the Conflicts between Agriculture and Biodiversity Conservation in Europe–A Review. *Agriculture, Ecosystems & Environment*, *124*(1-2), 60-71. Lindblom, J., Lundström, C., Ljung, M., & Jonsson, A. (2017). Promoting Sustainable Intensification in Precision Agriculture: Review of Decision Support Systems Development and Strategies. *Precision Agriculture*, *18*, 309-331. Reed, M. S. (2008). Stakeholder Participation for Environmental Management: a Literature Review. *Biological Conservation*, *141*(10), 2417-2431.

[50] Schut, M., Klerkx, L., Sartas, M., Lamers, D., Mc Campbell, M., Ogbonna, I., & Leeuwis, C. (2016). Innovation Platforms: Experiences with their Institutional Embedding in Agricultural Research for Development. *Experimental Agriculture*, *52*(4), 537-561.

[51] Johnson, N. L., Balagamwala, M., Pinkstaff, C., Theis, S., Meinzen-Dick, R. S., & Quisumbing, A. R. (2017). *How Do Agricultural Development Projects Aim to Empower Women? Insights from an Analysis of Project Strategies* (Vol. 1609). Intl Food Policy Res Inst. Plieninger, T., Schleyer, C., Schaich, H., Ohnesorge, B., Gerdes, H., Hernández-Morcillo, M., & Bieling, C. (2012). Mainstreaming

with local agricultural extension services, farmer cooperatives, and non-governmental organizations (NGOs) to reach marginalized communities and remote areas.

v. **Public Dialogues:** Facilitate public dialogues and consultations on agricultural policies to encourage open discussions, feedback, and constructive engagement from diverse stakeholders is a very effective means to promote awareness of government policies.[52] This could help identify challenges, gaps, and opportunities in policy implementation and foster greater transparency and accountability in decision-making processes.

vi. **Capacity Building:** Providing capacity-building support to local government officials, agricultural extension workers, and community leaders to effectively communicate and implement agricultural policies at the grassroots level has been tried in many countries successfully.[53] This could include training programs on policy analysis, advocacy, and outreach strategies tailored to local contexts and needs.

By implementing these interventions, governments can bridge the knowledge gap, enhance stakeholder engagement, and promote informed decision-making in agricultural policy formulation and implementation processes.

Among the 300 respondents, only 30% were working with agricultural background, among which, 93.75% were satisfied with the yield. The satisfaction is an indirect indication that the governmental policies are supportive on the overall basis, as they have been successful in obtaining the targeted yield. So, major interventions may not be necessary to improve yield. However, to sustain the present yield government may consider the following interventions:

Ecosystem Services through Reformed European Agricultural Policies. *Conservation Letters*, *5*(4), 281-288.

[52] Cheyns, E. (2011). Multi-stakeholder Initiatives for Sustainable Agriculture: Limits of the 'Inclusiveness' Paradigm. *Governing through Standards: Origins, Drivers and Limits*, 318-354. Yami, M., van Asten, P., Hauser, M., Schut, M., & Pali, P. (2019). Participation without Negotiating: Influence of Stakeholder power Imbalances and Engagement Models on Agricultural policy Development in Uganda. *Rural Sociology*, *84*(2), 390-415.

[53] Agunga, R., & Manda, L. Z. (2014). Communication for Strengthening Agricultural Extension and Rural Development in Malawi. *Journal of Development and Communication Studies*, *3*(1), 1-16. Issa, F. O. (2013). Building the Capacity of Agricultural Extension Personnel for Effective Implementation of Agricultural Transformation Agenda in Nigeria. *Journal of Agricultural Extension*, *17*(1), 78-88.

i. **Irrigation Infrastructure Improvement:** Enhance irrigation infrastructure by constructing and maintaining canals, reservoirs, and water storage facilities to ensure consistent water supply for agricultural activities, especially during dry periods.

ii. **Soil Health Management:** Implement soil health management programs to improve soil fertility and productivity through practices such as soil testing, organic fertilization, and soil conservation measures like terrace farming and contour plowing may be considered as successfully tried in other places.[54]

iii. **Crop Diversification and Rotation:** Promote crop diversification and rotation practices to minimize pest and disease pressures, improve soil health, and enhance overall agricultural resilience.[55] Encouraging farmers to grow a variety of crops suitable for the region can also help mitigate climate risks.

iv. **Access to Quality Seeds and Inputs:** Ensure timely availability of quality seeds, fertilizers, pesticides, and other agricultural inputs at affordable prices to farmers. Establish seed banks and agricultural extension services to disseminate improved varieties and best practices that has been successfully tried.[56]

v. **Adoption of Climate-Smart Agriculture:** Encourage the adoption of climate-smart agricultural practices such as conservation agriculture, agroforestry, and precision farming techniques to optimize resource use efficiency, reduce environmental impacts, and enhance climate resilience recommended by experts in the field.[57]

---

[54] Kumar, S., Sarkar, D., Das, K., Mondal, B., Biswas, H., Bishnoi, R., & Dwivedi, B. S. (2023). Land. In *Trajectory of 75 years of Indian Agriculture after Independence* (pp. 443-474). Singapore: Springer Nature Singapore. Mwanake, H., Mehdi-Schulz, B., Schulz, K., Kitaka, N., Olang, L. O., Lederer, J., & Herrnegger, M. (2023). Agricultural Practices and Soil and Water Conservation in the Trans boundary Region of Kenya and Uganda: Farmers' Perspectives of Current Soil Erosion. *Agriculture*, *13*(7), 1434.

[55] Mohanty, L. K., Singh, N. K., Raj, P., Prakash, A., Tiwari, A. K., Singh, V., & Sachan, P. (2024). Nurturing Crops, Enhancing Soil Health, and Sustaining Agricultural Prosperity Worldwide through Agronomy. *Journal of Experimental Agriculture International*, *46*(2), 46-67.

[56] Donovan, J., Rutsaert, P., Spielman, D., Shikuku, K. M., & Demont, M. (2021). Seed value chain development in the Global South: Key issues and new directions for public breeding programs. *Outlook on Agriculture*, *50*(4), 366-377. Vernooy, R., Adokorach, J., Kimani, D., Marwa, A., Mayoyo, A., & Nyadanu, D. (2023). Policies, laws and regulations in support of farmer-managed seed systems: still a long way to go. A review of 14 countries in Africa. ISSD Africa, Alliance of Bioversity International and CIAT, Rome, Italy.

[57] Roy, T., Kalambukattu, J. G., Sarkar, A., Rashmi, I., Pal, R., Singhal, V., ... & Kumar, S. (2024). Climate Crisis and Adoption of Climate-Smart Agriculture Technologies. In *Climate Crisis: Adaptive Approaches and Sustainability* (pp. 229-252). Cham: Springer Nature Switzerland.

vi. **Research and Development Support:** Invest in agricultural research and development to develop region-specific crop varieties, technologies, and farming practices tailored to the coastal Karnataka region's agro-ecological conditions and climate challenges.

vii. **Farmer Training and Extension Services:** Strengthen farmer training and extension services to build capacity, improve agronomic knowledge, and promote the adoption of sustainable agricultural practices.[58] Conduct workshops, field demonstrations, and knowledge-sharing platforms to empower farmers with the latest farming techniques and innovations.

viii. **Market Access and Value Chain Development:** Facilitate market access for farmers by improving transportation infrastructure, establishing market linkages, and promoting value addition and agro-processing industries. Support the development of farmer producer organizations (FPOs) and cooperatives to strengthen farmers' bargaining power and enhance their participation in value chains.[59]

ix. **Financial Support and Risk Management:** Provide financial support, subsidies, and insurance schemes to farmers to mitigate production risks, manage input costs, and invest in modern agricultural technologies and infrastructure. Implement crop insurance schemes to protect farmers against yield losses due to natural calamities and pace fluctuations.

x. **Policy Support and Governance:** Develop and implement supportive policies, regulations, and governance mechanisms that prioritize sustainable agriculture, land-use planning, and natural resource management. Foster partnerships between government agencies, research institutions, civil society organizations, and private sector stakeholders to promote collaborative and inclusive approaches to agricultural development in coastal Karnataka.

By implementing these interventions, the government can support farmers in coastal Karnataka to sustain good yield, improve livelihoods, and enhance food security while promoting environmentally sustainable agricultural practices.

---

[58] Singh, R. B., Paroda, R. S., & Dadlani, M. (2023), Indian Agriculture Towards 2030. *World*, *821*(51), 151.

[59] Kumari, S., Bharti, N., & Tripathy, K. K. (2021). Strengthening Agriculture Value Chain through Collectives: Comparative case Analysis. *International Journal of Rural Management*, *17*(1_suppl), 40S-68S.

4. Objective 4 - To trace out whether Endosulfan spray / agency violating the agricultural policies in the study areas.

The survey report reveals that 80.3% of the respondents had not received any instructions before the spraying of Endosulfan, 16.7% had received instructions, 2.3% were not aware of spraying Endosulfan, and the 0.7% knew to some extent about the possibility of spraying the Endosulfan. This clearly shows that KCDC violate the agricultural policy. Regarding the use of pesticides, majority of the farmers emphasized that the use was essential to protect the crop; however, Endosulfan was completely avoided.

The survey data reveals a variety of physical and mental disabilities reported among respondents. Physical and mental disabilities account for the highest frequency, with 29%, followed by a combination of hyperactivity, intellectual disability, eye sight problems, paralysis, and depression at 13%. Additionally, multiple disorders and neuropathic problems are reported by 11.3% of respondents. Other combinations of disabilities include loss of memory with mental disability, diabetes, and mental retardation at 8.7%, hearing and speech problems with physical disability, psychiatric issues, and hunchback at 7%, eye sight problems with infertility, intellectual disability, fits, mental disability, stuttering, weakness, and leg disabilities at 6.7%, and psychiatric disability with intellectual disability also at 6.7%. Further combinations include vision problems with walking difficulties, hearing loss, weakness, stuttering, kidney issues, and bone erosion at 4.3%, Down syndrome with deafness, dumbness, and psychiatric disability at 3.7%, and deafness with dumbness, muscle pain, and walking difficulties at 3%. Rare occurrences include disabilities below the waist with hand and leg disabilities, disorders of the central nervous system, and Apasmara at 1.3%, stuttering with intellectual disorder and short neck at 1.3%, handicapped individuals with hunchback and short stature along with eye sight problems at 1%, and anaemia with autism at 0.7%. Lastly, urinary problems with physical disability and uterus cancer are reported by 0.7% of respondents.

i. **Strengthen Awareness Campaigns:** As mentioned before, enhancement of government-led awareness campaigns to educate farmers and the general

public about the harmful effects of Endosulfan and other pesticides. These campaigns should emphasize the health risks associated with pesticide exposure and promote safer alternatives.

ii. **Community Engagement:** Foster greater involvement of local communities through initiatives such as Neighbourhood Interaction and Endosulfan Protest Committees to raise awareness at the grassroots level. Encourage community members to share knowledge and experiences regarding pesticide use and its impacts.

iii. **Training and Support for Health Workers:** Provide training and support for Panchayath/Asha Workers and Primary Health Care (PHC) providers to effectively communicate information about pesticide risks and provide assistance to affected individuals.

iv. **Access to Information:** Ensure easy access to information about pesticides, their side effects, and safe handling practices through government channels, agricultural extension services, and digital platforms.

v. **Monitoring and Regulation:** Strengthen monitoring and regulation of pesticide use to enforce compliance with safety standards and prevent the illegal or unauthorized use of hazardous pesticides like Endosulfan.

vi. **Research and Development:** Invest in research and development of safer and more sustainable pest management practices, including the promotion of integrated pest management (IPM) techniques that minimize reliance on chemical pesticides.

vii. **Support for Transition:** Provide financial and technical support to farmers transitioning away from harmful pesticides like Endosulfan to eco-friendly alternatives, including organic farming methods and biopesticides.

The survey identified various combinations of diseases among the respondents, reflecting the complex health challenges faced by individuals affected by Endosulfan exposure. The highest number of respondents had developed Physical and Mental disabilities (29%), indicating a significant burden of both physical and psychological impairments within the surveyed population. Other prevalent combinations included Hyperactivity, Intellectual disability, Eyesight problems, Paralysis, and Depression (13%), followed by multiple disorders and Neuropathic problems (11.3%), and Loss of memory, Mental disability, Diabetes, and Mental

retardation (8.7%). A range of other health issues such as Hearing and speech problems, Psychiatric disabilities, Infertility, Fits, Weakness, and Bone erosion were also reported, albeit at lower frequencies.

Recommendations for Government Interventions:

i. **Healthcare Provision**: Strengthening of healthcare infrastructure in affected areas to provide comprehensive medical services, including specialized treatment and rehabilitation programs tailored to address the diverse health needs of Endosulfan victims may be considered.
ii. **Mental Health Support:** Establishing mental health support services to address the psychological distress and mental health disorders prevalent among Endosulfan victims, including counselling, therapy, and psychiatric care seems to be the necessity in the affected area.
iii. **Disability Rights and Accessibility:** Ensuring the implementation of disability rights legislation and accessibility standards to promote the inclusion and empowerment of individuals with disabilities resulting from Endosulfan exposure would be necessary. This includes providing assistive devices, accessibility ramps, and barrier-free environments.
iv. **Awareness and Education:** As mentioned before conducting public awareness campaigns to educate communities about the health risks associated with Endosulfan exposure and the available support services for affected individuals is necessary. This should include information on preventive measures, early detection of symptoms, and available healthcare resources.
v. **Research and Surveillance:** Allocating resources for ongoing research and surveillance programs to monitor the health outcomes of Endosulfan exposure, identify emerging health concerns, and inform evidence-based interventions and policy decisions may be considered.
vi. **Compensation and Social Support:** Implementing fair and timely compensation mechanisms for Endosulfan victims to address economic losses, healthcare expenses, and livelihood disruptions is also necessary. Additionally, providing social support programs to facilitate community

integration, vocational training, and income-generating opportunities for affected individuals and families would help the needy.

5. Objective -5: To trace whether the Endosulfan victims are properly rehabilitated or not.

The results of the survey support the Hypothesis 2 -The victims of the Endosulfan are not given proper compensation and redress their grievances.

The survey revealed that 96% of the respondents had approached the government to address their grievances, while the remaining 4% had not approached. Among those who had approached the government, the majority (51.7%) had sought assistance from Health Departments, Doctors, District Health Officers (DHO), and Panchayath. This was followed by 42.7% who approached Panchayath, Teachers, and Village Rehabilitate workers (VRWs), and the remaining 5.6% sought help from Anganwadi workers, Asahayaka Seva Trust, Puttur. Additionally, almost an equal number of respondents felt that their grievances were either fully addressed (41%) or addressed to some extent (40.3%), while the remaining felt that their issues were not addressed (18.7%). Based on this finding some interventions have been suggested.

Recommendations for Government Interventions:

i. **Strengthen Healthcare Infrastructure:** Allocating resources to improve healthcare facilities, particularly in rural areas, to ensure accessibility and quality healthcare services for Endosulfan victims may be considered.
ii. **Enhance Outreach Programs:** Conduct awareness campaigns and outreach programs, as mentioned before, to inform the affected population about available government services and support mechanisms for addressing their grievances.

iii. **Capacity Building:** Provide training and capacity-building programs for government officials, including health workers, teachers, and Panchayath members, to effectively address the needs and concerns of Endosulfan victims.

iv. **Streamline Grievance Redressal Mechanisms:** Establish efficient grievance redressal mechanisms at various levels of government administration to ensure prompt and effective resolution of issues raised by Endosulfan victims.

v. **Collaboration with NGOs and Civil Society:** Collaborate with non-governmental organizations (NGOs) and civil society groups to supplement government efforts in providing support and assistance to Endosulfan victims, particularly in areas where government services are limited.

vi. **Regular Monitoring and Evaluation:** Implement regular monitoring and evaluation mechanisms to assess the effectiveness of government interventions in addressing the grievances of Endosulfan victims and to identify areas for improvement.

The results of the survey support the Hypothesis 2 -The victims of the Endosulfan are not given proper compensation and redress their grievances.

The survey findings indicate that almost equal numbers of respondents have approached (53%) as well as not approached (47%) NGOs for assistance, with the majority of those who approached mainly contacting the Endosulfan Protest Committee. While a majority of respondents were satisfied with the services received from NGOs (51.3%), a small percentage expressed dissatisfaction (1.7%). Regarding government support, a significant proportion (68.7%) felt that their demands had been met, while a smaller percentage felt they were partially met (11.7%) or not met (19.7%). A majority of respondents (56%) reported receiving advice against Endosulfan use from social organizations, with Asha workers being the primary source. Despite awareness of government facilities for Endosulfan victims (89.7%), a majority had not taken help from relief or rehabilitation cells (70.3%). Additionally, respondents expressed dissatisfaction with the adequacy of government pension to meet treatment expenses (84.7%) and their ability to cover treatment costs (83%). However, majority of the respondents were happy with the facilities provided by the government.

Recommendations for Government Interventions:

i. **Enhance NGO Support:** Collaborating with NGOs like the Endosulfan Protest Committee to ensure effective and accessible support services for victims, addressing their diverse needs and concerns is again emphasized based on this survey result.
ii. **Strengthen Government Support:** Improving the efficiency and responsiveness of government assistance programs to meet the demands of Endosulfan victims comprehensively should be a continuous process until the desired results are obtained.
iii. **Increase Awareness:** As mentioned before, conducting awareness campaigns to educate Endosulfan victims about available government facilities and support services, ensuring they can access the assistance they need.
iv. **Improve Financial Assistance:** Reviewing and potentially increase the government pension to adequately cover the treatment expenses of Endosulfan victims, alleviating their financial burden has to be considered.
v. **Enhance Healthcare Accessibility:** Expanding free medical camps and healthcare services in affected areas to provide regular and accessible healthcare support to victims, addressing their medical needs effectively is necessary.
vi. **Monitor Satisfaction:** Regularly assessing the satisfaction levels of Endosulfan victims with government facilities and services, incorporating their feedback to improve service delivery and meet their expectations more effectively is emphasized.

6. Hypothesis 3: The information on the Endosulfan policy and their repercussions are not well addressed in the civil society to pressuring the Government as an interest group.

This hypothesis is supported as the survey results indicated that awareness of agricultural policies among respondents is notably low, with only 3.7% indicating awareness of such policies, while a significant majority, comprising 96.3%, reported a lack of awareness. This stark contrast underscores a concerning gap in knowledge regarding governmental initiatives and regulations pertaining to agriculture. The overwhelming majority of respondents being

unaware of agricultural policies suggests a potential disconnect between policymakers and the general populace, highlighting the need for improved communication channels and educational efforts to disseminate information about agricultural policies effectively. Addressing this awareness gap is crucial for fostering informed decision-making, enhancing stakeholder engagement, and ultimately promoting the successful implementation of agricultural policies aimed at addressing various challenges within the agricultural sector. It also underscores the importance of initiatives focused on raising awareness, conducting outreach programs, and facilitating public dialogues to bridge this knowledge divide and ensure a more informed and participatory approach to agricultural policy-making which are also recommended in other sections.

7. Hypothesis 4: Lack of awareness among the farmers in the field area, on the merits and demerits of the agricultural policies especially on Endosulfan

Hypothesis stands supported through the survey results. Among the 300 respondents, only 96 were farmers, among whom 66 (68.75%) were using pesticides to improve their yield. The make of the pesticides majority (86.4%) were: Bordeaux Solution, Urea, Suphala, and Bio-Insecticides and the remaining (13.6%) used Suphala and Urea. Majority of the respondents (73.3%) expressed that use of pesticides was essential and all of them felt that the purpose was to control insects. However, none of them have used Endosulfan in the current period. Among the 300 respondents, 85.7% knew that Endosulfan was banned in Karnataka and 74.3% knew about the side effects of Endosulfan. Among those who knew about side effects, majority (92.8%) knew about the Multiple Disorder, and the remaining 7.2% had known about the Physical and Mental Disorder. About the awareness creation of the side effects of Endosulfan, among the 300 respondents, majority (60%).

Based on the survey results indicating pesticide usage among farmers and awareness regarding Endosulfan, several remedial actions and steps can be proposed by the government. Firstly, there is a need for targeted education and training programs to raise awareness among farmers about the potential health and environmental impacts of pesticide usage, emphasizing safer alternatives

and integrated pest management practices. Additionally, agricultural extension services should be strengthened to provide guidance on sustainable farming practices and the judicious use of pesticides. Furthermore, the government should intensify efforts to enforce bans on hazardous pesticides like Endosulfan, ensuring strict compliance with regulations to protect public health and the environment. Collaborative initiatives with agricultural associations and NGOs can facilitate outreach programs to disseminate information about pesticide risks and promote safer agricultural practices. Moreover, investing in research and development for eco-friendly alternatives to conventional pesticides would be beneficial in mitigating pesticide-related risks while supporting sustainable agriculture. A comprehensive approach involving education, regulation, and support measures is necessary to address the complex challenges associated with pesticide usage and promote a safer and more sustainable agricultural sector.

8. Hypothesis 5: The state Government is ineffective in implementing the ban and sale of the pesticides.

This hypothesis is partially supported. The survey revealed that a majority of respondents, comprising 85.7%, were aware that Endosulfan is banned in Karnataka. Only a small percentage, 13.3%, indicated that they were not aware of the ban, while an even smaller proportion, 1.0%, mentioned being aware to some extent. This indicates a significant level of awareness among the surveyed population regarding the ban on Endosulfan in Karnataka. Nevertheless, addressing the significant portion of the surveyed population, approximately 13.3%, who indicated unawareness of the ban on Endosulfan in Karnataka necessitates immediate government action to mitigate potential risks to public health and the environment. To this end, comprehensive public awareness campaigns should be launched across various communication platforms to educate the populace about the ban's implications and the hazards associated with Endosulfan usage. Concurrently, educational initiatives targeting agricultural communities, schools, and relevant stakeholders should be implemented to promote awareness and compliance. Training and capacity-building programs must be offered to farmers and pesticide retailers,

emphasizing the adoption of safer alternatives and sustainable farming practices. Strengthening regulatory enforcement mechanisms, supporting farmers in transitioning away from Endosulfan, implementing health monitoring initiatives, and undertaking environmental remediation efforts are imperative steps to ensure citizen safety and environmental protection while facilitating a smooth transition towards safer agricultural practices.

9. The question through hypothesis 6 - Whether there is a tie between the Government and Endosulfan companies for its continuation?

The survey findings indicate that none of the 300 respondents were currently using Endosulfan, resulting in a nil quantity of usage. Regarding awareness of the use of banned pesticides as a punishable offense, 68.7% of respondents were aware, while 31.3% were not. Furthermore, a majority (68.7%) of respondents were using organic pesticides instead of Endosulfan, with 55.3% utilizing Organic and Poultry manure, and the remaining 44.7% using Bio Pesticides and Bio-insecticides. Interestingly, 86.7% of respondents were unaware of pesticides other than Endosulfan, with only 13.3% having knowledge, primarily about Bordeaux Solution and Bio-insecticides. These findings highlight the prevalence of organic pesticide usage among respondents and a notable lack of awareness about alternatives to Endosulfan in the surveyed population. These points support the argument that the answer to the question through hypothesis 6 is “No”.

12.3 In addition to the findings through survey results discussed in the preceding sections, on various issues related to the effect of Endosulfan, suggestions from the respondents were solicited for improving the conditions. The majority, comprising 72% of respondents, have demanded an increase in pension, free medical facilities, establishment of permanent rehabilitation centres, free ambulance services, and quick access to medicines. Additionally, 12% of respondents seek free medical house facilities from each Panchayath, along with demands for free education, employment facilities, free ration, and mobile health units. Furthermore, 7.7% of respondents highlight the need for mobility aids, rehabilitation centres, physiotherapy, nutritional supplements, and government jobs for victims. Smaller percentages of respondents have varied demands, including self-employment

opportunities, assistance with utility bills, improved health facilities, and the establishment of Endosulfan centres in each Taluk. As, all the interventions recommended before meet this requirements no newer ones have been suggested in this section.

12.4. One sample t-test was performed to find if there was a significant difference in the parameters of interest of Endosulfan victims based on the occupation of their parents. The implication of this study is that parental occupation may not be a significant determinant of Endosulfan exposure among the respondents. However, further research is warranted to explore other potential factors contributing to Endosulfan exposure and its impact on individuals and communities. Additionally, interventions aimed at mitigating the adverse effects of Endosulfan exposure should consider broader socio-economic and environmental determinants beyond parental occupation.

12.5. One sample t-test was performed to find if there was a significant difference in the parameters of interest of Endosulfan victims based on the Annual income. The income groups considered were - up to 50,000, 51,000-75,000, 75,001-1,00,000, and above 1,00,000 Indian Rupees. The implications of these results suggest the need for comprehensive interventions that go beyond addressing income disparities alone. Efforts should focus on providing holistic support to Endosulfan victims, including access to healthcare, education, vocational training, and livelihood opportunities. Additionally, policies aimed at environmental remediation and prevention of chemical exposure should be prioritized to prevent similar incidents in the future and mitigate the long-term socio-economic impacts on affected communities.

12.6. One sample t-test was conducted to find if there was a significant difference in the Landholdings of the respondents. Implications of these findings may indicate that the landholding sizes of the respondents, who are victims of Endosulfan exposure, do not significantly deviate from the expected average. However, it is crucial to note that while this particular statistical test does not find a significant difference, other factors related to land ownership and management could still be impacted by Endosulfan exposure. Therefore, further investigation into the socio-economic effects of Endosulfan contamination on land use, agricultural productivity, and livelihoods is warranted. Additionally, interventions aimed at supporting

affected communities should consider holistic approaches that address both immediate needs and long-term sustainability concerns related to land resources.

12.7. One sample t-test was conducted to test if there was a significant difference in respondents in terms of their Housing status. The implications of this finding are twofold. Firstly, it indicates that Endosulfan exposure may not significantly influence the housing status of the affected individuals. However, it is crucial to note that this finding should not undermine the potential adverse effects of Endosulfan exposure on other aspects of individuals' lives, including health, socio-economic status, and overall well-being. Secondly, the lack of a significant difference in housing status highlights the need for comprehensive interventions and support systems for Endosulfan victims that extend beyond housing considerations. These interventions should address the multifaceted challenges faced by affected individuals and communities, including access to healthcare, education, livelihood opportunities, and environmental rehabilitation. Overall, while housing status may not be a primary concern in the context of Endosulfan exposure, broader efforts are required to address the complex needs of affected populations comprehensively.

Thus, it is clear that there are several interventions that can be considered by the government to improve the conditions of the Endosulfan victims and improve the conditions prevailing in the region where this research has been conducted as indicated in the 20 points mentioned in this chapter.

CONCLUSION

The part of the study provides the conclusion to the research conducted on Endosulfan exposure, aiming to understand the impact of this harmful pesticide on individuals and communities. It provides the details of the conclusions that could be arrived based on the survey conducted on the victims of Endosulfan exposure on the amount of awareness among the farmers about the dangers of Endosulfan, the impact of Endosulfan on environment, the loopholes of agricultural policies, effectiveness of agricultural policies, and most importantly if victims are properly rehabilitated or not.

The findings through the survey have been used to address these points:

1. Awareness about the dangers of Endosulfan

The Objective-1 of this research was to find the awareness of the respondents about the dangers of Endosulfan. Based on the findings indicating the extent of family members suffering from Endosulfan illness, it is evident that a significant proportion of households are affected by the adverse effects of Endosulfan exposure. With 85.3% reporting at least one family member suffering from Endosulfan illness, and 12.7% reporting two members affected, the data underscores the widespread impact and severity of Endosulfan exposure within communities. Moreover, the presence of three or more affected members, although relatively low at 2%, further emphasizes the profound health implications and potential risks associated with Endosulfan contamination. These findings have provided basis for the comprehensive interventions to address the dangers of Endosulfan exposure, including healthcare support, environmental remediation, and regulatory measures to prevent further harm to individuals and communities. Effective mitigation strategies and concerted efforts are essential to alleviate the suffering and protect the well-being of those affected by Endosulfan-related illnesses.

Based on the survey findings, on the overall basis, approximately 31.3% of the respondents reported being affected by health conditions, while the majority, constituting 68.7%, did not report any health issues as the consequences of Endosulfan exposure. These results suggest that a significant proportion of the surveyed population has experienced health problems, which may be attributed to various factors such as pesticide exposure, environmental pollution, or other underlying causes. The prevalence of health conditions among respondents underscores the importance of further investigation and interventions to address health disparities and promote overall well-being within the community. Additionally, targeted healthcare interventions and public health initiatives may be warranted to provide support and assistance to individuals affected by health issues, while preventive measures should be prioritized to mitigate future health risks. Overall, these findings emphasize the need for continued efforts to monitor and address health concerns within the surveyed population, with a focus on promoting health equity and improving healthcare access for all individuals.

2. Impact of Endosulfan on environment

The objective-2 of this research was to study the impact of Endosulfan on environment. Through the findings of the survey it could be concluded that the causes of Endosulfan victimization among the surveyed population, the majority of respondents, comprising 74.3%, attributed victimization to the spraying of Endosulfan in farms by the National Research Cashew Corporation (NCCO), indicating a widespread recognition of the association between agricultural pesticide use and adverse health outcomes. Additionally, a significant proportion, accounting for 17% of respondents, identified exposure through a combination of air and water contamination, underscoring the multifaceted nature of Endosulfan exposure pathways and the potential for environmental contamination to impact human health. Furthermore, a smaller yet noteworthy percentage of respondents, representing 4% and 4.7% respectively, reported victimization through food, breast milk, and blood contamination, highlighting the transmission of Endosulfan residues through various pathways and the potential risks to vulnerable populations such as infants and breastfeeding mothers. These findings underscore the importance of raising awareness about the diverse modes of Endosulfan exposure and the associated health effects to mitigate risks and protect public health. It could also be concluded that government interventions were necessary to mitigate the ill effects of Endosulfan. Two of the interventions were - effective communication and education efforts are essential to empower communities with knowledge about Endosulfan exposure pathways and promote preventive measures to minimize adverse health impacts.

3. Loopholes in agricultural policies

The Objective-3 was to find if there were any loopholes in agricultural policies which included the development of the policies as well as disseminating them to the farmers and gaining their approval for successful implementation. The survey data underscores a concerning lack of awareness among respondents regarding agricultural policies. With only 3.7% of respondents indicating awareness of agricultural policies, the overwhelming majority, accounting for 96.3%, are not adequately informed about these crucial regulations and guidelines. This disparity highlights a significant gap in knowledge dissemination and outreach efforts pertaining to agricultural policies. Addressing this lack of awareness is imperative for ensuring the effective

implementation and compliance of agricultural policies, which play a pivotal role in promoting sustainable farming practices, environmental conservation, and the overall well-being of agricultural communities. Efforts should be intensified to enhance educational campaigns, outreach programs, and communication strategies aimed at raising awareness and fostering greater understanding of agricultural policies among farmers and stakeholders in the form of governmental interventions. By bridging this awareness gap, policymakers and agricultural authorities can foster greater engagement, participation, and adherence to agricultural policies, thereby contributing to the advancement of the agricultural sector and the achievement of broader socio-economic and environmental objectives.

4. Violation of agricultural policies by Endosulfan spray agency

The objective-4 was to investigate if there was violation of agricultural policies by Endosulfan spray agency. The data suggested that a significant portion of the population, comprising 68.7%, believed that the government is indeed ignoring the demands regarding agricultural policies. On the other hand, 19.7% feel that the government is not ignoring these demands, while 11.7% believe that the government is addressing them to some extent. Furthermore, the data revealed that majority of respondents , totalling 80.3% reported that they were not received any instruction before spraying Endosulfan. On the other hand 16.7% of the respondents states that they were received instructions before spraying the Endosulfan by the Karnataka Development Board (KCDC) and 0.7% knew to some extent about the possibility of spraying, 2.3% were not aware of spraying Endosulfan. This indicates a widespread perception of dissatisfaction and neglect among the populace regarding the government's approach to agricultural policies. Such sentiments may reflect underlying concerns about the effectiveness and responsiveness of government actions in addressing agricultural issues, highlighting the need for greater attention and reform in this crucial sector.

5. Rehabilitation of Endosulfan Victims

The Objective-5 was to investigate whether the Endosulfan victims were rehabilitated to their level of satisfaction or not. The survey results indicated a high level of perceived government support for rehabilitation, with 96.0% of respondents affirming

that their grievances are addressed by the government. This suggests that the majority of individuals feel that the government is actively engaging with and responding to their needs in the realm of rehabilitation. The small percentage (4.0%) who indicated otherwise may represent a minority of individuals who feel their grievances were not adequately addressed or acknowledged by the government. Overall, the high percentage of positive responses reflects a generally positive perception of the government's approach to addressing grievances related to rehabilitation. However, it's important for policymakers to continue monitoring and addressing any concerns raised by the minority to ensure inclusive and effective support for all individuals requiring rehabilitation services.

The comprehensive analysis of the research objectives reveals significant findings regarding the awareness of Endosulfan dangers, its impact on health and the environment, loopholes in agricultural policies, potential violations by Endosulfan spray agencies, and the rehabilitation of victims. Firstly, the widespread prevalence of Endosulfan-related illnesses among surveyed households underscores the urgent need for comprehensive interventions to address the adverse effects of exposure. Moreover, the majority of respondents attribute victimization to the spraying of Endosulfan, highlighting the critical role of government interventions in mitigating environmental contamination and protecting public health. However, there exists a concerning lack of awareness regarding agricultural policies among respondents, indicating a crucial gap in knowledge dissemination and implementation. Additionally, there is a widespread perception of dissatisfaction with government responsiveness to agricultural policy demands, suggesting a need for greater attention and reform in this sector. Despite these challenges, the high level of perceived government support for rehabilitation is a positive indicator, though efforts must continue to address any concerns and ensure inclusive support for all affected individuals. Overall, these findings emphasize the importance of coordinated efforts between government agencies, stakeholders, and communities to address the multifaceted challenges posed by Endosulfan exposure and ensure the well-being of affected populations.

This research has resulted in several interventions that may be initiated by the government. They include: Compensation and Rehabilitation, Awareness and Education, Environmental Remediation, Healthcare Services, Research and

Development, Healthcare Access, Support Services, Medical Assistance, Long-Term Support, Advocacy for Safer Alternatives, Education and Counseling, Regulation and Policy Measures, Access to Treatment and Rehabilitation, Community Engagement and Support, Economic Opportunities, Collaboration and Partnerships, Improved Communication Channels, Stakeholder Engagement, Outreach Programs, Public Dialogues, Capacity Building, Irrigation Infrastructure Improvement, Soil Health Management, Crop Diversification and Rotation, Access to Quality Seeds and Inputs, Adoption of Climate-Smart Agriculture, Farmer Training and Extension Services, Market Access and Value Chain Development, Financial Support and Risk Management, and Policy Support and Governance. While these interventions were suggested on the basis of individual components of the survey the government may initiate the interventions in a phased manner and as these are the interventions that are successfully tried in similar situations elsewhere they are surely worth a try.

It is important to mention the limitation of this research and also scope for future research. One limitation of the research based on quantitative survey is the potential for response bias, as respondents may provide socially desirable answers or inaccurately recall information related to Endosulfan exposure and its effects. Additionally, the survey data may not fully capture the nuances and complexities of Endosulfan contamination, as it relies on self-reported information and may overlook certain population groups or geographic areas. Furthermore, the scope of the research could be expanded to include qualitative methods such as interviews or focus groups, which would provide deeper insights into the lived experiences and perceptions of individuals affected by Endosulfan exposure. Future research endeavours could also explore the long-term health outcomes and environmental consequences of Endosulfan contamination in greater detail, as well as evaluate the effectiveness of various intervention strategies in mitigating its impact. By addressing these limitations and expanding the scope of inquiry, future research has the potential to contribute valuable insights towards addressing the challenges posed by Endosulfan exposure and promoting sustainable solutions for affected communities.

In conclusion, the research on Endosulfan exposure and interventions holds immense significance and relevance to coastal Karnataka, as it sheds light on the widespread impact of this hazardous pesticide on the health and environment of local

communities. The findings underscore the urgent need for comprehensive interventions to address the adverse effects of Endosulfan exposure, including healthcare support, environmental remediation, and regulatory measures. Moreover, the identification of loopholes in agricultural policies and potential violations by spray agencies emphasizes the importance of effective governance and policy enforcement to safeguard public health and environmental sustainability. As coastal Karnataka continues to grapple with the legacy of Endosulfan contamination, concerted efforts are required from government authorities, stakeholders, and communities to implement evidence-based interventions and ensure the well-being of affected populations. By addressing these challenges head-on and prioritizing the health and safety of its residents, coastal Karnataka can pave the way towards a healthier and more sustainable future for generations to come.

13. References

Books

- Ahmed, W, (2011). *India's New Economic Policy; a Critical Analysis*. New Delhi, Rawat.
- Andrew, M Barkley and Paul, W. Barkley. (2013). *Principles of Agricultural Economics*. Routledge Publications. London.
- Bandyopadhyay, P.C. (2016). *Fertigation, Fundamentals and Application*, Biotech Books New Delhi.
- Datt, Gaurav, Ashwini Mahajan, *Indian Economy*. S. Chand and company. New Delhi.
- Datt and Sundharam's, *Indian Economy*. S. Chand and company. New Delhi.
- Deshpande, R.S. (2010), (ed.) *Agrarian Crisis and Farmers Suicides*. Sage Publication. New Delhi.
- Devendra, Thakur. (1993). (ed.) *Role of Agriculture in Economic Development*. Deep & Deep Publications. New Delhi.
- Dhingra, C.Ishwar. (2011). *The Indian Economy- Environment and Policy* Sultan Chand and Sons publications. New Delhi.
- Gaurav, Datt and Ashwani, Mahajan (2008). *Indian Economy*. S Chand and Company Limited. New Delhi.
- Ishwar, C. Dhingra. (2011). *The Indian Economy Environment and Policy*. Sultan Chand & Sons. New Delhi.
- Jain, H.K. (2010). *The Green Revolution: History, Impact and Future*, Stadium Press LLC.
- Jules, Pretty Earthscan, (2005), (ed.) The Pesticides Detox (Earth scan) UK.
- Krishnamurthy, H.R. *Bharatada Arthika Vyavasthe*, (2004). Sapna Book House. Bangalore.

- Malcolm, S. Adiseshiah, (1989). (ed.) The Economies of the States of the Indian Union. Lancer International. New Delhi.
- Margarita, Stoytcheva. (2014). (ed.) *Pesticides in the Modern World* – Risks and Benefits. InTech Crotia.
- Misra, S.K. and Puri, V.K. (2000). *Economic Environment of Business.* Himalaya Publishing House, New Delhi.
- Raj, Kapila & Uma, Kapila (2002). (ed.) *Indian Agriculture in the Changing Environment*, Academic Foundation, New Delhi.
- Raj, Pravin, T., H. Philip, (2004). *Agriculture Policy Planning in India.* Agrobios. India. Jodhpur.
- Rajan, K. (2006). *Indian Economy.* (The Post Reform Scenario), Serials publications New Delhi.
- Ramesh, Arora (2011). (ed.) *Theory and Practice of Integrated Pest Management*. Scientific Publishers. Jodhpur.
- Ramesh, Chand. (2005) (ed.) *India's Agricultural Challenges – Reflections on policy, Technology and other issues.* New Concept Information System Limited. New Delhi.
- Sahay, B.R., M.P. Shrivastava, (2011). *National Agricultural Policy in the New Millennium*. Anmol Publications. New Delhi.
- Sarma, J.S. (1982). *Agricultural Policy in India – Growth with Equity.* International Development Research Centre.
- Sengupta, Sivani, *Indian Agriculture*. (2008). ABD publishers. Jaipur.
- Sharma, K.K. *Pesticide Residue Analysis manual 1993 Directorate of Information and publication of Agriculture*. New Delhi.
- Shovan, Ray. (2007). (ed.) Oxford *Handbook of Agriculture in India*. Oxford University Press. New Delhi.
- Singh, Buta, Bhatt V.S (1985), (ed.) *Problems and prospects of Agriculture in India*, Indian council of Agricultural Research.
- Singhal, Vikas, (2003). *Indian Agriculture*. Indian Economic Data Research Centre.
- Sthanumoorthy, R. (2007) (ed.), *Karnataka Economy*. Icfai University Press. Hyderabad.
- Sundar, I. (2009). *Principles of Agricultural Economics*. Sarup Book Publishers. New Delhi.
- Thimmaiah, G. and K. Rajan. (2004). *State of the Indian Farmer – Policy and Organisational Support.* Academic Foundation. New Delhi.
- Varshneya, M.C., Javalekar, Anil. (2015), (ed.). *India's Perspective Policy on Agriculture*. Uttan Krushi Sansodhan Sanstha.
- Veeresh, G.K. (2006). *Organic Farming*. Foundation Book PVT Limited. New Delhi.
- Vyas, V.S. Bhargava, Pradeep (ed.) (1997). *Policies for Agricultural development- Perspectives from States*. Rawat Publications. New Delhi.

Articles/Papers

- Agricultural policy of Karnataka. (2006). *Dept. of Agriculture and Horticulture*. Bangalore.
- Agriculture Statistics at a glance. (2008). *Ministry of Agriculture, Government of India*, Academic Foundation, New Delhi.

- Andersen HR, Vinggaard AM, Rasmussen TH, Gjermandsen IM, Bonefeld-Jorgensen CE. Effects of Currently used Pesticides in assays for Estrogenicity, and Rogenicity and Aromatase activity in vitro. *Toxicol Appl Pharmacol*. 20025; 179(1):1-12.
- Cooper J, Dobson H. (2007). The Benefits of Pesticides to Mankind and the Environment. *Crop Prot.* 2007; 26(9):1337-48.
- Dayakar MM, Shivprasad D, Dayakar A, Deepthi CA. (2015). Assessment of Oral Health Status among Endosulfan victims in Endosulfan relief and Remediation cell- a cross-sectional survey. *J Indian Soc Periodontol*. 2015; 19(6):709.
- Embrandiri A, Singh RP, Ibrahim HM, Khan AB. (2012). An epidemiological study on the Health Effects of Endosulfan Spraying on Cashew Plantations in Kasaragod District, Kerala, India. *Asian J Epidemiol*. 5(1):22-31.
- Endosulfan Tragedy: Unrelenting struggle government's eye (Aug 23, 2012), *The Times of India*.
- In Endosulfan's Cruel Wake (6 February 2017), *Times of India.*
- Into the heart of Darkness Curse of Endosulfan (21 May 2012), *Deccan Herald.*
- Kalaivanan, D., and J. Dinakara Adiga (2021). The Cashew – A Fit Cash Crop for Organic Farming. *Kisan World* vol.48 July 2021 Pg. No 46-48.
- Karnataka's Endosulfan Victims to 'fast unto death' for Better Compensation, (2017). *Down to Earth*, 25 May 2017.
- Leela, Solomon. (2011). Endosulfan: Centre in Denial, *Economic and Political Weekly*, Vol XL VI NO.8 February 19, 2011.

Internet Sources

- Ashok, Patil and Jai Prabhakar SC, (2022). A Study on the Distribution of Health Complications among the Endosulfan Pesticide affected Victims of Karnataka, *Research Gate*, June 2022 (https://www.researchgate.net)
- Endosulfan Crisis – How it All Begun – http// endosulfanstudy biogspot in / 2012/10/ Endosulfan
- Final Report of the Investigation of Unusual Illnesses allegedly produced by Endosulfan exposure in Padre Village of Kasargod District (N.Kerala). Ahmedabad: National Institute of Occupational Health; 2002: 98. Availableat http://www.indiaenvironmentportal.org.in/files/NIOH-FinalReport.pdf. Accessed 11 May 2019.
- https://www.ncbi.nlm.nih.gov/pmc/articles/pmc7908628/
- https://www.thehindu.com
- Health Hazards of Aerial Spraying of Endosulphan in Kasaragod District, Kerala. Kerala: Government of Kerala; 2003. Available at http://www.India environmentportal.org.in/files/KeralaGovt_FinalReport.pdf. Accessed 11 May 2019.
- Into the Heart of Darkness (curse of Endosulfan), 21 May 2012 www.deccanherald.com)
- *Karnataka Agriculture Policy* – https ://uniqueexim.in
- Karnataka Bans use of Endosulfan, *The Hindu*, 17 February 2011 https://www.thehindu.com).
- Political Issues for endosulfan ban in India- http// endosulfanstudy biogspot in / 2012/10/ Endosulfan.

14. Questionnaire

Questionnaire on Agricultural Policies: Social Response and its Implications in Karnataka – A case study of Endosulfan in Dakshina Kannada

Interview Schedule for Victims of the Endosulfan

SL.No: **Area/Village:** **Date:**

1. General Information:

1. Name/ Address:

2. Age:

3. Gender:

4. Educational Qualifications:

5. Grama Panchayat:

6. Marital status:

a) Un married b) Married c) Divorcee d) Widow

7. Family Background:

a) Joint b) Nuclear c) Extended

8. Number of family members:

a) Male b) Female c) Total:

9. Annual Income:

a) Up to 50000 b) 50001- 75,000 c) 75,000 - 1,00,000 d) 1,00,000 and above

10. Size of landholdings:

a) Up to 5 Cents b) 5 – 10 cents c) 10.1 – 50 cents c) 50.1 – 1 Acre d) 1.1 acre – 2.5 acre e) above 2.5 acre

11. Age at marriage (years):

a) 15- 20 b) 21 -25 c) 26 – 30 d) 30 and above

II. Housing Facilities:

12. Type of house

a) Hut b) Kachcha c) Tiled d) RCC e) Others

13. Electricity a) Yes b) No

14. Toilet facility a) Yes b) No

15. Drinking Water Facility: a) Well b) Lake c) Pipe water d) Others:

III. Parents Details:

16. Father's age:

17. Mother's age:

18. Educational Qualification:

a) Father: b) Mother:

19. Father's Occupation:

20. Mother's Occupation:

IV. Additional Information:

21. Whether you are the victims of Endosulfan: a) Yes b) No

22. Whether you affected the Endosulfan?

a) Directly b) Indirectly

23. How do you become a victim of Endosulfan?

a) Spraying Endosulfan in farms by NCCO (National Research Cashew Corporation b) Air c) Water: (surface and ground water) d) Food: i) meat ii) fish iii) vegetables iv) Cow milk v) breast milk e) Blood f) Through placenta

24. Are you recognized as Endosulfan victim in Government Document?

1) Yes 2) No

25. How many people in your family suffering from Endosulfan illness?

a) 1 b) 2 c) 3 4) 4 5) All

26. Are you healthy enough to work / to go to school?

a) Yes b) No c) If no, mention the reason:

27. If you have any bad habits?

a) Yes b) No c) If yes, mention:

a) Smoking b) Alcoholic c) Using pan parag

28. Are you aware about the agricultural policies?

a) Yes b) No c) If yes, mention the agency:

29. If you working in the field, do you think that the yield is satisfactory? a) Yes b) No c) If no, mention the reason:

30. Are you using any pesticide to improve the yield?

a) Yes b) No c) If no, mention the reason:

31. What is the name of the pesticide?

a) Name: b) Don't know

32. Do you think that the pesticides are essential to improve the yield?

a) Yes b) No c) If yes, mention the reason:

33. Is there any improvement in your yield after using the Endosulfan?

a) Yes b) No c) Don't Know

34. Do you know that Endosulfan banned in Karnataka?

a) Yes b) No c) Some extent

35. Are you aware of the side effects of Endosulfan?

a) Yes b) No c) If yes, mention the side effects:

36. Has anybody given you awareness on side effects of Endosulfan?

a) Yes b) No c) If yes, mention it:

37. Do you know the types of diseases caused by Endosulfan?

a) Yes b) No

38. Do you think pest control is necessary?

a) Yes b) No c) If yes, states the reason:

39. Do you know the cost of Endosulfan?

a) Yes b) No c) To some extent

40. How much quantity you are using?

a) Per acre: b) Per month:

41. On what type of crops do you spray Endosulfan?

a) Paddy b) Vegetables c) Cashew nut d) Arecanut

42. How many times in a season you spray Endosulfan?

a) Once b) Twice

43. Are you following the precautionary steps suggested by the manufacturer before using the Endosulfan?

a) Yes b) No

44. Are you aware of using banned pesticides are a punishable offence?

a) Yes b) No

45. Are you used any organic pesticide instead of Endosulfan?

a) Yes b) No c) If yes, mentions the name of organic pesticide?

46. Do you aware about any other pesticide giving the same yield but no adverse effects on human beings?

a)Yes b) No

47. Are you aware of Government promoting any organic pesticide?

a)Yes b) No c) Don't know

48. Are you approach the representatives to redress your grievances?

a) Yes b) No c) If yes, whom?

49. Is your representatives responding your demands positively?

a) Yes b) No

50. When you have a health related problem?

a) From the birth itself b) After spraying Endosulfan c) Don't Know

51. What is (are) the diseases you are affected with?

Name of the disease:

52. Are you approaching the NGOs about your problems?

a) Yes b) No c). If yes, mention the name of NGO:

53. Are you satisfied with the help of NGOs?

a) Yes b) No

54. Do you feel that the government is ignoring your demands?

1. Yes 2. No 3. To Some extent

55. Is there any other social Organisations advice you not to use Endosulfan? a)Yes b) No c) Don't know

56. If yes, mention the agency through which you get the advice?

a) Field officer b) Asha worker c) Social activists d) Media

57. Are you aware of the facilities provided by the government to the Endosulfan victims?

a) Yes b) No c) To some extent

58. If yes, mention the facilities provided by the Government to the Endosulfan victims?

a) Free bus pass b) Free Medical Checkup c) Pension d) Relief / Rehabilitation cell e) If any, other:

59. Have you taken any help from relief / rehabilitation cell?

a)Yes b) No

60. Are you satisfied with the Rehabilitation Centre Timings/ facilities?

a) Yes b) No 3. Moderately Satisfied 4) If no, is there any suggestion for improvements?

61. Are you aware about the rehabilitation provided by the neighbouring state? a) Yes b) No c) Some extent

62. Are you demanding permanent compensation or pension to the Endosulfan victims?

a) Yes b). No c) If yes, i) Permanent compensation ii) monthly pension

63. Is concerned authority giving you any instruction before spraying Endosulfan?

a) Yes b) No c) Don't Know

64. If yes, are you followed the instructions of concerned authority?

a) Yes b) No c) Some extent

65. How many times free medical camp is conducted in the affected area?

a) Once in 2 months b) Once in 6 months c) Once in a year

66. Is Government pension is enough for your treatment?

a) Yes b) No

67. If no, how much money you spent for your treatment?

a) 1,500 b) 3,000 c) 5,000 d) 10,000

68. Are you in a position to meet out the medical expenses for your treatment? a) Yes b) No

69. Are you happy with facilities of the Government?

a) Yes b) No c) Some extent

70. Any suggestion:

15. Details of National/ International Presentations and Publications:

Attached.

***